ANNEXURE TO INDENT NO:

PROCUREMENT, MANUFACTURE, SUPPLY, TESTING & COMMISIONING OF WHEEL BOGIE SYSTEM FOR SLC- (ANNEXURE- II)

SPECIFICATIONS & PRICE SCHEDULE

OWNER : INDIAN SPACE RESEARCH ORGANISATION

PROJECT : SSLV LAUNCH COMPLEX (SLC)

LOCATION : **SSLV PROJECT OFFICE**, SURVEY NO. 260-3C, MADHAVANKURICHI VILLAGE – 628206, OPP. TO **KOODAL NAGAR, THIRUCHENDUR TK., TUTICORIN DIST., TAMILNADU**

SSLV LAUNCH COMPLEX (SLC)
SATISH DHAWAN SPACE CENTRE
SRIHARIKOTA -524124
INDIAN SPACE RESEARCH ORGANISATION

WHEEL BOGIE SYSTEM SPECIFICATIONS & ANNEXURES			
SECTION	**SPECIFICATION NO:**	**ISSUE NO.**	**TITLE: WHEEL BOGIE SYSTEM SPECIFICATIONS DOCUMENT**
SPECIFICATIONS			
A1	SPEC: SLC-BOGIE-01	R0	General Terms and Conditions of the Contract
A2	SPEC: SLC-BOGIE-01	R0	General Specifications & Project information
B1	SPEC: SLC-BOGIE-01	R0	Scope of work & Technical Specifications
B2	SPEC: SLC-BOGIE-01	R0	Painting specification for bogie system
B3	SPEC: SLC-BOGIE-01	R0	Quality Assurance Plan
B4	SPEC: SLC-BOGIE-01	R0	Welding specification for shop and site fabricated equipment
ANNEXURES			
C1	SPEC: SLC-BOGIE-01	R0	Schedule of prices & general particulars
C2	SPEC: SLC-BOGIE-01	R0	Bid qualification criteria
C3	SPEC: SLC-BOGIE-01	R0	Schedule for general particulars / vendor evaluation format
C4	SPEC: SLC-BOGIE-01	R0	Exceptions and deviations
C5	SPEC: SLC-BOGIE-01	R0	Schedule of bidder’s experience
C6	SPEC: SLC-BOGIE-01	R0	Data to be filled along with the bid for supply & commissioning of bogie
C7	SPEC: SLC-BOGIE-01	R0	Check list

	ENCLOSURES			
SR.NO	**DRAWING TITLE**	**DRAWING NUMBER**	**Version**	**SHEET**
1.	GA of Bogie system	10-MECH-12-8-15/A1 sheet 1 of 1	R1	1
2.	Wheel Bogie assembly	10-MECH-12-8-16/A1 sheet 1 of 1	R1	1
3.	Interconnecting Frame	10-MECH-12-8-17/A1 sheet 1 of 2	R1	1
4.	Interconnecting Frame	10-MECH-12-8-18/A1 sheet 2 of 2	R1	1
5.	Interconnecting Structure RH	10-MECH-12-8-19/A1 sheet 1 of 3	R1	1
6.	Interconnecting Structure RH	10-MECH-12-8-20/A1 sheet 2 of 3	R1	1
7.	Interconnecting Structure LH	10-MECH-12-8-21/A1 sheet 1 of 2	R1	1
8.	Interconnecting Structure LH	10-MECH-12-8-22/A1 sheet 2 of 2	R1	1
9.	Maintenance Platform	10-MECH-12-8-23/A1 sheet 1 of 2	R1	1
10.	Maintenance Platform	10-MECH-12-8-24/A1 sheet 2 of 2	R1	1
11.	Rail Clamp Bracket	10-MECH-12-8-25/A1 sheet 1 of 1	R1	1
12.	Hauler Interface Frame and Towing Plate	10-MECH-12-8-26/A1 sheet 1 of 1	R1	1
13.	Balancer	10-MECH-12-8-27/A1 sheet 1 of 1	R1	1
14.	Yoke	10-MECH-12-8-28/A1 sheet 1 of 1	R1	1
15.	Yoke Pin	10-MECH-12-8-29/A1 sheet 1 of 1	R1	1
16.	Wheel Shaft	10-MECH-12-8-30/A1 sheet 1 of 1	R1	1
17.	Hinge pin, Spacer, Locking	10-MECH-12-8-31/A1 sheet 1 of 1	R1	1

	Plate & Bearing Covers			
18.	Wheel, Bearing Cover, Spacer & Shaft Locking Plate	10-MECH-12-8-32/A1 sheet 1 of 1	R1	1
19.	Spacer Block -1	10-MECH-12-8-33/A1 sheet 1 of 1	R1	1
20.	Spacer Block - 2	10-MECH-12-8-34/A1 sheet 1 of 1	R1	1
21.	Bearing Retainer	10-MECH-12-8-35/A1 sheet 1 of 1	R1	1
22.	Jack Support Structure	10-MECH-12-8-36/A1 sheet 1 of 1	R1	1
23.	GA of Axle turning	10-MECH-12-8-37/A1 sheet 1 of 1	R1	1
24.	Interconnecting Structure	10-MECH-12-8-38/A1 sheet 3 of 3	R1	1
25.	GA of wheel bogie system	10-MECH-12-8-39/A1 sheet 1 of 1	R1	1
26.	Layout of Bogie System for Electrical cable routing	SLC/BOGIE/2024/001	R0	1

SECTION –A1

GENERAL TERMS AND CONDITIONS OF THE CONTRACT

PROPOSAL DOCUMENT, CLARIFICATION AND ADDENDUM

Quotations are invited from the interested bidders for the enclosed scope of work in two-part bid.
Part-1 technical & unpriced part of the work and Part-2 Priced commercial part.

Only experienced Bidders who are qualifying in bid-qualification criteria given in Section C2 only should quote.

The RFP document is organized in Seven sections as follows.

Section –A 1: General Terms and Conditions of the Contract

Section –A 2 : General Specifications & Project information

Section –B1 : Scope of work & Technical Specifications.

Section –B2 : Painting specification for bogie system

Section –B3 : Quality Assurance Plan

Section –B4 : Welding specification for shop and site fabricated equipment

Section- C1 to C7 : Annexures.

Title of the proposal

"SUPPLY, TESTING AND COMMISSIONING OF BOGIE SYSTEM FOR SLC"

at

"SSLV PROJECT OFFICE, SURVEY NO. 260-3C, MADHAVANKURICHI VILLAGE – 628206, OPP. TO KOODAL NAGAR, THIRUCHENDUR TK., TUTICORIN DIST., TAMILNADU"

Date Public Notification issued by ISRO: as per the notification

Last Date of downloading tender Document by tenderer: as per the notification

Last date of submission of tender documents in online by tenderer: as per the notification

Last date of Bid sealing in online by ISRO: as per the notification

Last date for giving open authorisation in online by tenderer: as per the notification

1. PROPOSAL DOCUMENT

1.1. Bidder shall sign & stamp each page of the tender document (RFP) as token of his acceptance and submit the same before order placement.

1.2. Proposal documents shall remain the property of SDSC SHAR and shall not be used for any another purpose without the consent of SDSC SHAR.

1.3. The proposal shall be completely filled in all respects and shall be tendered together with requisite information & Annexure. Any offer incomplete in any particulars is liable to be rejected.

1.4. The Proposal (Unpriced Techno-commercial bid) with a complete set of the required documents shall be up-loaded in ISRO e-procurement website.

1.5. The Proposals shall be submitted on-line before the time limit for bid submission specified in the Letter Inviting Bid.

1.6. Supplier shall submit the open authorisation online with in the time limit specified in the Letter Inviting bid.

1.7. The Proposal will be opened on the date and on the time specified in the Letter Inviting Bid or as soon thereafter as convenient. Proposal not received in time will not be considered.

1.8. Bidders shall set their quotations in firm figures and without variations/additions in the terms of the Proposal documents.

1.9. AMBIGUITY

Should there be any ambiguity or doubt as to the meaning of any of the tender clause/condition or if any further information is required, the matter shall be immediately brought to the notice of Head, Purchase & Stores of SDSC SHAR in writing

2. PREPARATION OF BIDS

2.1 SITE VISIT

Bidder is advised to visit & examine the site and its surrounding to familiarize himself of the existing facilities & environment and shall collect all other information which may require for preparing & submitting the Bid and entering into the contract. Claims and objections due to ignorance of existing conditions or inadequacy of information will not be considered after submission of the Bid and during implementation.

2.2 VALIDITY OF OFFER

Bid shall remain valid for acceptance for a minimum period of 4 (four) months from the due date of submission of the Bid. The Bidder shall not be

entitled during the said period to revoke or revise his Bid or to vary the Bid except and to the extent required by SDSC SHAR in writing. Bid shall be revalidated for extended period as required by SDSC SHAR in writing. In such cases, unless otherwise specified, it is understood that validity is sought and provided without varying either the quoted price or any other terms & conditions of Bid finalized till that time.

2.3 COST OF BIDDING

All direct and indirect costs associated with the preparation and submission of bid shall be to Bidder's account and SDSC SHAR will in no case be responsible or liable for those costs, regardless of the conduct or outcome of the bid process.

2.4 APPLICABLE LANGUAGE/ MEASUREMENTS

The bid and all correspondence incidental to and concerning the bid shall be in the English Language. For supporting document and printing literature submitted in any other language, an accurate English Translation shall also be submitted. Responsibility for correctness in translation shall lie with the Bidder.

All the measurements shall be given in metric system.

2.5 ARRANGEMENT OF BID

The Bid shall be neatly presented on white paper with consecutively numbered pages. It should not contain any terms and conditions which are not applicable to the Bid. The Bid and all details submitted by the Bidder shall be signed and stamped on each page as token of acceptance, by a person legally authorised to enter into agreement on behalf of the Bidder. (Corrections / alteration, if any, shall also be signed by the same person).

2.6 SCHEDULE OF PRICES

The schedule of prices shall be read in conjunction with all the sections of proposal document. The price must be filled online in the same format of 'Schedule of Prices' in Section C1. No copy of price bid shall be enclosed along with other document and upload the same anywhere in the e-procurement portal.

2.7 DOCUMENTS COMPRISING THE BID

Bids shall be arranged in the following order.

2.7.1 <u>Part – I : Technical and Unpriced Commercial Part</u>

Technical and unpriced commercial part shall comprise the attachments, specifying attachment number arranged in the order as follows:

(a) Submission of bid letter.
(b) Power of attorney in favour of authorised signatory of the bid / proposal documents.
(c) All the annexure in Section-C1 to C7 enclosed in proposal duly filled, signed and sealed
(d) Bid qualification criteria and all supporting documents.

(e) Write-up on the detailed procedure to be followed for manufacturing, supply, testing at vendor & at SLC Site of all the items.

(f) Unpriced copy of schedule of prices with all other commercial terms, taxes, duties, exemption certificates and conditions duly filled (Prices to be kept blank), signed and stamped.

(g) Audited balance sheet including profit and loss account for last three financial years showing annual turn over

(h) Latest income tax certificate for last three financial year.

(i) Latest solvency certificate from a scheduled bank for a value not less than 2.0 Cr.

(j) Description of the procedures adapted for material procurement, fabrication with deviations from technical specification and proposed design modifications.

(k) Data sheets for all the equipment & checklists enclosed in proposal duly filled, signed & stamped.

(l) Technical literature & data sheets of equipment / machinery used by him and any other document as mentioned in the proposal.

(m) Project execution plan

(n) Any other relevant document, bidder desires to submit.

2.7.2 Part – II : Priced Commercial Bid

Priced commercial bid shall be filled online in the price bid format. Schedule of prices also to be filled in the online format and no separate document shall be attached. Deviations in terms and conditions, assumptions, conditions, discounts etc. shall be stipulated in format specified in the portal. SDSC SHAR will not take cognizance of any such statement and may at their discretion reject such bids.

3. BID SUBMISSION

Bids duly filled in by the Bidder should invariably be submitted as stipulated in the Letter inviting bid. Bids shall be submitted in the following manner.

3.1 PART – I: UN PRICED TECHNO-COMMERCIAL PART OF THE BID FOR THE WORK

Complete Techno–commercial part of the bid shall be filled online in the “Vendor Specified Terms’ form of the e-tender. Any documents related, technical literature, guarantee / warrantee certificates and any other

relevant documents as per the tender shall be scanned in lower resolution format and uploaded to the e-tender under 'Documents solicited from Vendor' form only in ISRO e-procurement portal (https://eprocure.isro.gov.in).

The deviation statement and checklist shall be filled online, without which the bid will not be considered.

3.2 PART – II : PRICE PART OF THE BID FOR THE WORK

Price bid shall be filled in the on-line 'price bid' form of the e-tender only in ISRO eprocurement website https://eprocure.isro.gov.in . The cost of spares and other prices shall be filled in the respective forms available on-line in the eportal. Any other terms and conditions given in this part shall not be considered and if insisted upon by the Bidder, bids are liable for rejection.

a) SDSC SHAR may open Part – I of the bid on the due date of opening subject to meeting the minimum evaluation criteria. Price Bids (Part-II) of technically and commercially acceptable offers shall be opened at a later date.

b) SDSC SHAR reserves the right to reject any or all the Bids without assigning any reasons thereof.

c) **Any bids/offers with price details in Techno-Commercial Offer (Part –I) shall be rejected.**

4. Vendor Evaluation Format

SDSC SHAR seeks response to the given questionnaire for assimilating data which would be used for evaluating the capability of the supplier for executing the referred work. Hence, the supplier is requested to provide only genuine data and any discrepancy found at a later point of time may result in rejection of the supplier from purchase process. Furnishing of data cannot be construed as automatic qualification for participation in the tender. Questionnaire should be signed by a responsible and authorized person of the Company / Agency.

Schedule of general particulars / vendor evaluation format shall be filled as per Section: C3. Schedule of Bidders experience and details of present works being executed are to be filled as per Section : C5.

Note: In order to consider as valid experience, all the experience has to be supported with the technical details, completion certificate and purchase order.

5. DETERMINATION OF RESPONSIVENESS

SDSC SHAR will scrutinize tenders to determine whether the tender is substantially responsive to the requirements of the tender documents. For the

purpose of this clause, a substantially responsive tender is one which inter-alia conforms to all the terms and conditions of the entire Tender document without any deviations and reservations. The decision of SDSC SHAR shall be final in this regard.

6. BID EVALUATION

6.1 During evaluation, SDSC SHAR may request Bidder for any clarification on the bid or additional documents.

6.2 Techno-commercial discussion (pre-bid meeting) shall be arranged with Bidder in offline & online mode. Bidder shall depute his authorised representatives for attending discussions. The representatives attending the discussions shall produce authorisation from his organisation to attend the discussion and sign minutes of meeting on behalf of his organisation. The authorised representative must be competent and empowered to settle/decide on all technical and commercial issues.

Pre bid meeting shall be organised within 10 working days from the release of tender. Intimation about pre bid meeting will be informed through our EGPS system / website.

6.3 Bidder must provide the point-by-point compliance to the technical specifications along with deviations as per “Schedule of deviations” attached in ` C4. The tender will be rejected, if the deviations are not acceptable to the Department.

6.4 Performance of Bidder on similar nature of works executed/ under execution shall be taken into consideration before selecting the Bidder for opening his price bid.

6.5 The time schedule for completion is given in the Proposal document. Bidder is required to confirm the completion period unconditionally.

6.6 SDSC SHAR reserves the right to accept a bid other than a lowest and to accept or reject any bid in full or part without assigning any reasons. Such decisions by SDSC SHAR shall bear no liability whatsoever consequent upon such decision.

6.7 The Bidder, whose bid is accepted by SDSC SHAR, shall be issued a Letter of Intent (LOI) /Purchase Order (PO) to proceed with the work. Bidder shall confirm acceptance by returning a signed copy of the LOI/PO.

SECTION –A2

GENERAL SPECIFICATION & PROJECT INFORMATION

1. SCOPE OF WORK AND TECHNICAL SPECIFICATIONS

The detailed scope of work and technical specifications are given in Sections B1, B2, B3 & B4 of this document. The general terms and conditions are given below.

2. SUPPLIER's OBLIGATIONS & FUNCTIONS

2.1 SPECIFICATIONS AND DRAWINGS

The Supplier shall execute the works in compliance with the provisions of Contract, good engineering practices and codes requirements.

2.2 SUBMISSION OF TECHNICAL DOCUMENTS

Supplier shall prepare and submit to SDSC SHAR for approval of following documents and drawings:

2.2.1 Technical literatures & data sheets of equipment used by him.

2.2.2 General arrangement drawings of the bogie system and assembly plan at supplier site.

2.2.3 Details of heat treatment / stress relieving equipment.

2.2.4 Details of Turning machines / milling machines to be used for machining.

2.2.5 Assembly Shop layout drawings suitable for control assembly of drives.

2.2.6 Erection sequence schedule along with erection drawings.

2.2.7 Detailed Quality Assurance Plan

2.2.8 No activity shall be executed unless SDSC SHAR’s approval is obtained. The above documents shall be submitted in a format approved by SDSC SHAR.

2.3 PROCUREMENT, FABRICATION & SUPPLY

Supplier shall carry out procurement, fabrication and supply of the Wheel bogie system in accordance with the scope, technical specifications and terms & conditions of contract.

2.4 DELIVERY AND STORAGE

2.4.1 Dispatch Instructions given in the Contract shall be strictly followed. Failure to comply with the instructions may result in delay in payment apart from imposing any other charges as may be deemed to fit.

2.4.2 The Supplier shall be responsible for transporting all the equipment to site, unloading and storage.

2.4.3 No equipment shall be delivered without obtaining dispatch clearance from SDSC SHAR.

2.4.4 All the equipment shall be properly packed to avoid any damage during transportation / handling / storage and any damage found has to be replaced free of cost.

2.4.5 The equipment received at site shall be stored at a place assigned for this purpose.

2.4.6 Supplier shall take proper care while storing the equipment and shall provide watch & ward at his own cost.

3. INSTALLATION

3.1 GENERAL

3.1.1 Supplier’s staff shall include adequate number of competent erection engineers with proven experience on similar works to supervise the erection works and sufficient skilled, unskilled and semiskilled labour to ensure completion of work in time.

3.1.2 Supplier's erection staff shall arrive at site on date agreed by SDSC SHAR. Prior to proceeding to work, Supplier shall however, first ensure that required/sufficient part of his supply has arrived at site.

3.1.3 Erection of equipment may be phased in such a manner so as not to obstruct the work being done by other Suppliers and / or operating staff who may be present at that time.

3.1.4 During erection, Department's quality team / their engineer will visit site from time to time with or without Supplier’s engineer to establish conformity of the work with specification. Any deviations, deficiencies or evidence of unsatisfactory workmanship shall be corrected as instructed by Department.

3.1.5 Supplier shall carry out work in a true professional manner and strictly Adhere to the approved drawings. Any damage caused by Supplier during erection to new or existing building / environment shall be made good at no extra cost to Department.

3.2 RECORDS

Supplier shall maintain records pertaining to the quality of erection work in a format approved by Department. Whenever erection work is complete, Supplier shall offer erected equipment for inspection to Department's engineer who along with Supplier's engineer will sign such records on acceptance.

3.3 WHEEL BOGIE SYSTEM ERECTION/ASSEMBLY

3.3.1 Ø1.2m wheels will be issued as a free issue material to the qualified party upon submission of bank guarantee.

3.3.2 Supplier shall carry out the works in accordance with the specific Instructions given on the approved drawings, method statements, manufacturer’s drawings / documents or as directed by Department. Equipment shall be erected in neat manner so that they are level, plumb, and square and properly aligned and oriented. Tolerances shall be as established in manufactures drawings or as stipulated by Department. No equipment shall be welded or bolted, until its alignment is checked and found acceptable by Department.

3.3.3 Supplier shall provide all supervision, labour, tools, machines, cranes, equipments, scaffolding, rigging material and incidental material such as bolts, wedges, anchors, etc. required to complete the works. Supplier shall also provide at his own cost all such consumables like oxygen – acetylene gas, welding rods, grinding wheels, temporary supports, shims etc. required to complete work.

3.3.4 Supplier shall take utmost care while handling instruments, delicate equipment, panels etc. and protect all such equipment on erection.

3.4 SAFETY

Supplier shall follow the safety regulations / codes and shall take necessary measures at his own cost.

3.5 ERECTION & CONSTRUCTION POWER

3.5.1 As it is a new place and no power supply is available at site, Vendor has to arrange required electrical power for completing this order.

3.5.2 Material handling equipment required for loading or unloading, erection, testing and commissioning at SLC site is in the scope of vendor.

3.6 SITE PREPARATION / CLEARANCE

No site preparation works are planned by SLC Project for site fabrication works. Only environmental clearance will be provided for site preparation works. Preparation of required site for any fabrication and approach requirements for handling the wheel bogie systems shall be in scope of contractor. The site identified in such works shall be within 400m from the SAF building location.

Upon completion of work, supplier shall remove all his equipment and material from the site within one month or time mutually agreed. Supplier at all times shall keep site in clean condition and remove all unwanted material at regular intervals. In case supplier fails to remove all their equipment and material within the mutually agreed time, it is deemed that SDSC SHAR will arrange to remove the same at Supplier's cost.

3.7 ACCOMMODATION

Supplier shall make their own arrangement for accommodation, transportation & canteen facility for all his staff, technicians, labour & workers.

3.8 MEDICAL FACILITIES

Supplier shall make their own arrangement at their own expenses for medical facilities for site personnel.

3.9 WORK PROGRAMME

Supplier shall prepare a detailed program schedule for review / approval by SDSC SHAR. Supplier as per exigencies of work shall revise and update programme periodically.

3.10 SUB-CONTRACTS

3.10.1 No work shall be sub-contracted without prior approval of SDSC SHAR.

3.10.2 Supplier shall be responsible for the proper execution of any sub-contract placed by him in connection with this purchase order.

3.10.3 Supplier shall furnish to SDSC SHAR the copies of all un-priced sub-orders showing promised delivery dates and places.

3.11 CHANGES AND MODIFICATION TO SPECIFICATIONS, DRAWINGS AND QUALITATIVE / QUANTITATIVE REQUIREMENTS

3.11.1 Supplier shall obtain approval from SDSC SHAR before initiating the action for procurement of bought out items.

3.11.2 During the fabrication review, supplier has to carry out the mutually agreed modifications to meet the overall requirement.

3.12 RECORD OF DRAWINGS AND O&M MANUALS

3.12.1 Supplier shall submit 3 hard copies & one soft copy of all the approved drawings incorporating any modification / changes made during the execution of CONTRACT. All these drawings shall be marked as 'As Built'.

3.12.2 Supplier shall submit 3 hard & one soft copy of O&M manual. These manuals should indicate weekly, monthly and yearly maintenance schedule and other instructions necessary for safe maintenance of equipment.

3.12.3 Submission of the drawings and manuals shall be a precondition for releasing of any final payment due to Supplier.

3.13 TAXES AND DUTIES

3.13.1 The tendered items as per the above subjected tender comes under “Scientific and technical instruments, apparatus, equipment, accessories, parts, components, spares, tools, mock ups and modules, raw material and consumables required for launch vehicles and satellites and payloads” having GST @ 5% (As per Dept of Revenue IGST Notification No. 25/2018 Integrated Tax (Rate) Schedule-I ; Sl. No.243B dt: 31.12.2018 (Amendment to Notifications No. 7/2018-Integrated Tax (Rate) dt: 25.01.2018. Clause A (ix) about Schedule I 243A))
Kindly accept to offer the item with 5% GST against End User Certificate from our Competent Authority that the items belong to the above category

3.13.2 It is the responsibility of the contractor to issue the Tax Invoice strictly as per the format prescribed under the relevant applicable GST law (CGST Act/SGST Act/UTGST Act/IGST Act). Contractor to indicate the proper GSTN Registration/ HSN code in their tax invoices.

3.13.3 CGST/SGST/UTGST/IGST shall be paid at actuals against Tax Invoice but restricted to the amount and percentage in the contract.

3.13.4 GST details of SDSC SHAR are given below:

Designation	: Purchase and stores officer VALF
Contact no	: 08623-226082
GSTIN	: 37AAAGS1366J1Z1

3.14 STATUTORY VARIATION

Statutory variation for CGST/SGST/UGST/IGST is applicable, provided the actual completion of services does not occur beyond the period stipulated in the order/contract or any extension (without levy of penalty). For variation after

the agreed completion periods, the service provider alone shall bear the impact for the upwards revisions.

For downward revisions, the Department shall be given the benefit of reduction in CGST/SGST/UGST/IGST.

3.15 RISK COVERAGE

The Supplier shall arrange comprehensive risk coverage at his own cost covering the value of equipment including transportation to the site from manufacturer's works, storage at site till demonstration, testing at site. The period of such coverage shall be up to contractual completion period or any extension granted by Department thereof.

3.16 INCOME TAX

Income tax at the prevailing rate as applicable from time to time shall be deducted from the supplier's bills as per Income Tax Act,1961 and the rules there-under or any re-enactment or modifications thereof and a TDS certificate shall be issued.

3.17 BANK GUARANTEE FOR SECURITY DEPOSIT CUM PBG:

Furnish a Combined Bank Guarantee towards Security Deposit and Performance Bank Guarantee for 3% of the order value immediately within10 days after release of purchase order on Rs.100/- non-judicial stamp paper from a Nationalized/Scheduled bank as per the format enclosed valid till the completion of total contractual obligation (i.e, supply period+ warranty period+60 days). This will not carry any interest and shall be returned to you after successful completion of contractual obligations. In case of non-performance/poor performance the Bank Guarantee shall be forfeited. If BG is not submitted within specified period, this order is liable to be cancelled

3.18 PACKING AND FORWARDING

3.18.1 The Supplier shall arrange to have all the material suitably packed as per the standards and as specified in the contract. Unless otherwise provided for in the contract, all containers (including packing cases, boxes, tins, drums, and wrappings) used by the Supplier shall be non-returnable.

3.18.2 All packing and transport charges, transit handling costs, transit risk coverage and transport fees of agents employed at the place of delivery or elsewhere, shall be deemed included in the price to be paid to the Supplier.

3.19 ARBITRATION

In the event of any question, dispute of difference arising under these conditions or any conditions contained in the Purchase Order or in connection with this contract, (except as to any matters the decision of which is specially provided for by these conditions) the same shall be referred to the sole arbitration of the head of the Purchase Office or some other person appointed by him, it will be no objection that the arbitrator is a Government Servant that he had to deal with matter to which the contract relates or that in the course of his duties as Government Servant he had expressed views on all or any of the matters in disputes or difference. The award of the arbitrator shall be final and binding on the parties of this contract.

It is Term of this contract:

a. If the arbitrator be the head of the purchase office.

   I. In the event of his being transferred or vacating his office by resignation or otherwise, it shall be lawful for his successor-in office either to proceed with the reference himself, or to appoint another person as arbitrator, (or).

   II. In the event of his being unwilling or unable to act for any reason, it shall be lawful for the Head of the Purchase Office to appoint another person as arbitrator: or

b. If the arbitrator be a person appointed by the Head of the Purchase Office in the event of his dying, neglecting or refusing to act, or resigning or being unable to act, for any reason, it shall be lawful for the Head of the Purchase Office either to proceed with the reference himself or to appoint another person as arbitrator in place of the outgoing arbitrator. Subject as aforesaid, the Indian Arbitration and Conciliation Act, 1996 and the rules there under and any statutory modifications thereof for the time being in force shall be deemed to apply to the arbitration proceedings under this Clause. The arbitrator shall have the power to the extent with the consent of the Purchaser and the Contractor the time making and publishing the award. The venue of arbitration shall be place as the purchaser in his absolute discretion may determine. Work under the Contract shall, if reasonably possible, continue during arbitration Proceedings.

3.20 APPLICABLE LAW AND JURISDICTION

The laws of India shall govern this purchase order for the time being in force. The Courts of Andhra Pradesh, India only shall have jurisdiction to be with and decide any legal matters or disputes what so ever arising out of the purchase order.

3.21 FORCE MAJEURE

Should a part or whole work covered under this purchase order be delayed due to reasons of Force Majeure which shall include legal lockouts, strikes, riots, civil commotion, fire accident, quarantines, epidemic, natural calamities and embargoes the completion period for work, equipment referred to in this agreement shall be extended by a period not in excess of the duration of such Force Majeure. The occurrence shall be notified within reasonable time.

3.22 WARRANTY

The bidder shall provide ***12 months'*** warranty for the entire system for a defect liability, and workmanship after final official handing over at his cost. During this period, supplier has to provide and adhere to the following:

3.22.1 He has to attend quarterly based preventive maintenance visits and breakdown maintenance calls. All the defective components have to be replaced or rectified on one to one basis.

3.22.2 Break down maintenance should be responded within 48 Hours' time and shall be completed within 48 Hours after respond.

3.22.3 Department will not provide any transport/accommodation.

3.22.4 In case vendor failed to attend and repair the system within 7 days from the date of reporting the problem, Department will reserve right to forfeiting the BG apart from withheld of any payment payable to the vendor.

3.22.5 Where defects in items are remedied under warranty, the period for which the warranty operates shall be extended by such period, as the items were not available to SDSC SHAR. Where defect items are replaced by new ones, the full warranty period stipulated in the purchase order shall apply to such replacement items as from the date of their delivery.

3.23 SCHEDULE OF PRICE

3.23.1 CONTRACT price shall include all costs of "Procurement, Manufacture, Supply, Erection, Testing and Commissioning of Wheel bogie system for SLC", shop testing, packing, forwarding, transport to site, unloading, storage, all risk coverage, erection, installation, testing & evaluation and commissioning of equipment including any other cost for proper and complete execution of the CONTRACT.

3.23.2 CONTRACT prices shall also include all travelling expenses, living expenses, salaries, overtime, benefit and any other compensation for engineers, supervisors, skilled, semiskilled workmen, watch and ward staff,

labours and other staff employed by the Supplier, cost of tools and tackles required for erection and other consumable material required, and all taxes, duties, and levies as applicable on the date of submission of bid.

3.23.3 Supplier shall quote the prices similar to price bid format enclosed as Section –C1 only in online.

3.23.4 Erection charges and third party inspection charges shall be firm and fixed.

3.23.5 The contractor shall agree for additional work of approximately 10t of the drawing bill of material as per Section-B1, Point:10.0

3.23.6 The rate quoted shall be on FOR SLC site, Tuticorin, Tamil Nadu, basis.

3.24 TERMS OF PAYMENTS

General guideline terms of payments are as indicted below. Any deviation to these payment terms to be brought out.

If the contract is terminated / delayed due to default of the contractor, the advance payment would be deemed as an interest-bearing advance at the interest rate (e.g., the interest rate of the General Provident Fund – GPF) prevailing on the date of release of advance payment, plus 2% to be compounded quarterly.

3.24.1 FOR SUPPLY OF ITEMS INLCUDING BOUGHTOUT ITEMS

Option-1:

a. 80% of supply cost payment against receipt of material at Purchasers / Department site, along with GST .

b. 20% of supply cost after successful commissioning & acceptance by Department of equipment and system covered under contract and against submission of Performance bank guarantee.

or

Option-2:

a. **30%** of supply cost as advance against submission of bank guarantee for an equal amount from a reputed nationalized/scheduled bank and shall be valid till Contract completion period. Format of Bank guarantee shall be obtained from Department after award of contract.

Note: Interest on advance will be loaded in cost to arrive L1

b. 60% of supply cost payment against receipt of material at Purchasers / Department site, along with GST (including for advance portion).

c. 10% of supply cost after successful commissioning & acceptance by Department of equipment and system covered under contract and against submission of Performance bank guarantee.

3.24.2 FOR ERECTION, TESTING AND COMMISSIONING OF WHEEL BOGIE SYSTEM AT SITE

Option-1:

a. **80%** of erection cost at department site after successful assembly of the beige in all respect, conducting functional checks and trail run (duly accepted by Department) along with GST.

b. **20%** of erection cost along with GST after successful commissioning, acceptance of equipment and system covered under contract by department and one trial run of bogie system at department site (rail track at department site and hauler shall be provided by department) and against submission of performance bank guarantee.

or

Option-2:

a. 20% of erection cost as advance after commencement of works at department site & against submission of bank guarantee valid till erection, commissioning and acceptance.

Note: Interest on advance will be loaded in cost to arrive L1

b. 70% of erection cost at department site after successful assembly of the beige in all respect, conducting functional checks and trail run (duly accepted by Department) along with GST (including for advance portion)

c. 10% of erection cost along with GST after successful commissioning, acceptance of equipment and system covered under contract by department and one trial run of bogie system at department site (rail track at department site and hauler shall be provided by department) and against submission of performance bank guarantee

3.24.3 FOR THIRD PARTY INSPECTION CHARGES

a. **50%** of third-party inspection charges after receipt of complete material at Department site.

b. **50%** of third-party inspection charges along with GST after Erection, Commissioning and acceptance of the system at department site.

3.25 DELIVERY SCHEDULE

The realization of fabrication works within the schedule is very essential. Hence, bidders are requested to adhere to the schedules given below. Contractor shall follow the following schedule for executing the contract:

S.No	Description of Target	Responsibility	Target Completion Date (in months)
1.	Purchase Order release	Dept.	T0
2.	Procurement, fabrication / machining, collection of Ø1.2m wheels from SDSC SHAR, inspection, handling, control assembly & test run at supplier's site, dismantling, packing, transportation and receipt of all items at SLC Site	Vendor	T1= T0 + 8 months
3.	Clearance for erection at Department Site.	Dept.	T2
4.	Control assembly at site, testing & qualification trials at Department site.	Vendor	T3=T2 + 2 months

3.26 LIQUIDATED DAMAGES

In the event of the supplier failing to complete the work within the delivery period specified in the contract agreement or in extension agreed thereto, Department shall reserve the right to recover from the Supplier as liquidated damages, a sum of 0.5 percentage per week or part thereof of the undelivered portion of the total contract price of equipment or work. However, the total liquidated damages shall not exceed 10.0 percentage of the total contract price.

3.27 DISCLOSURE AND USE OF INFORMATION

3.26.1 If the documents supplied by SDSC SHAR are marked **"Strictly Confidential"**, supplier shall take all necessary steps to ensure the same.

3.26.2 Supplier shall guarantee that all information and data received during execution of Purchase Order from SDSC SHAR shall be classified as **"confidential"** within the meaning of the Official Secrets Act and will not be divulged to any third party without prior written permission of SDSC SHAR. All drawings & documents shall be returned after execution of work.

3.26.3 No publicity of any kind whatsoever regarding this work shall be given without prior clearance from SDSC SHAR.

3.28 ACCEPTANCE AND REJECTION:

On completion of the work or part of the work as specified in the contract, the representative of the Department referred to, shall check as soon as possible, but in any event within one month of notification of readiness for acceptance that the work performed complies with the contract requirements as regards quantity and quality.

In the event of rejection of any of the articles, whereby the Supplier feels himself aggrieved, he may within eight days of the receipt of notification of rejection and before such articles have been removed from the place of inspection, give the Department notice of objection. Such objection shall be considered by a Board of Appeals of the Department. The Department shall, without prejudice to the arbitration clause in the contract, take a decision upon presentation of the Board's findings.

On completion of tests, the members of the Inspection Organisation of the Department or Inspection agency appointed by Department shall prepare a report, which must be countersigned by the Supplier.

3.29 SUSPENSION:

3.29.1 Department may notify the Supplier to suspend performance of any or all of his obligations under the Contract. Such notice will specify the reasons for suspension and the effective date of suspension. Supplier there upon shall suspend the performance of such obligations until ordered in writing to resume performance of Contract by Department.

3.29.2 If Supplier's performance or his obligations remain suspended or the rate of progress is reduced, then, the time of completion will be suitably extended and all costs incurred by Supplier as a result of suspension or reduction in rate of progress will be paid to Supplier provided that the

suspension or reduction in the rate of progress is not by reasons of Supplier's default or breach of Contract.

3.30 CANCELLATION

3.30.1 GENERAL RULE

The Department shall have the right at any time to cancel a contract either wholly or in part by giving written notice by registered mail. From the time of receipt of the written notice, the Supplier shall undertake to observe the instructions of the Department as to the winding up of the contract both on his

own part and on the part of his sub-suppliers.

3.30.2 WITHOUT FAULT OF SUPPLIER

In the case of cancellation of a contract by the Department without any fault of the Supplier, the Supplier shall on receipt of Department's instructions forthwith take the necessary steps to implement them. The period to be allowed to implement them shall be fixed by the Department after conclusion with the Supplier and, in general, shall not exceed three months.

Subject to the Supplier confirming, Department shall take over from the Supplier at a fair and reasonable price all finished parts not yet delivered to the Department, all unused and undamaged material, bought-out components and articles in course of manufacture in the possession of the supplier and property obtained by or supplied to the Supplier for the performance of the contract, except such material, bought-out components and articles in course of manufacture as the supplier shall, with the agreement of the Department, elect to retain.

3.30.3 WITH FAULT OF SUPPLIER:

The Department reserves the right, after full consideration of all relevant circumstances, including the observations of the supplier, to cancel a contract in any of the following circumstances.

3.30.3.1 In the event of the Supplier's failure to meet

a. The Technical requirements of the Supplier.

b. The Progress and/or delivery requirements.

3.30.3.2 If the Supplier has not observed the provisions of the contract concerning the disclosure and use of information provided by the Department.

3.30.3.3 If the Supplier fails to comply with the provisions of the contract concerning the equipment, supplies and technical documents made available by the Department.

3.30.3.4 If the Supplier transfers his contract without the Department's authorization or concludes sub-contracts against the Department's explicit directives.

3.30.3.5 In the event that Supplier unjustifiably repudiates the Contract or fails to ship or dispatch all or part of the goods ordered for reasons other than those attributed to the Department's actions or as provided in the Force Majeure clause, the Department may, by giving an appropriate notice in writing to the Supplier, fix a Date of Essence by which the Supplier must complete the dispatch in full. If the Supplier fails to do so, the Department, in addition to his right to recover Liquidated Damages in terms of the Contract, shall also have the right to cancel this Contract and make substitute purchases from other sources. If the goods are in a partial state of fabrication, Department may have the fabrication completed by other means, in which event Supplier shall be liable to Department for the additional expenses incurred thereby, but shall not have any claim on savings, if any, in such cases.

In the event of such cancellation, the Department shall unless otherwise specified in the contract, only pays,

- In the case of a fixed-cost contract for the supply of equipment or material. The contractual value of items delivered and accepted under the contract before receipt of notification of cancellation, or to be accepted under the special conditions of cancellation.

- In the other cases, a fair and reasonable price in respect of such work as has been carried out prior to the receipt by the Supplier of notification of cancellation.

3.31 FRAUDULENT PRACTICES, BRIBERY AND CORRUPTION OF GOVERNMENT SERVANTS

The contractor represents and undertakes that he has not given, offered or promised to give, directly or indirectly any amount, gift, consideration, reward, commission, fees, brokerage or inducement to any person in service of the department or otherwise in procuring the contracts or forbearing to do or for having done or forborne to do any act in relation to the obtaining or execution of the contract or any other contract with the Government for obtaining a contract or showing or forbearing to shoe favour or disfavour to any person in relation to the contract or any other contract with the government. Any breach of the aforesaid undertaking by the contract or any one employed by him or

acting on his behalf or for his benefit (whether with or without the knowledge of the contractor) or the commissioning of any offence by contractor or any one employed by him or acting on his behalf, as defined in chapter IX of the Indian Penal code, 1860 or the prevention of corruption Act. 1947 or any other Act enacted for the prevention of corruption shall, without prejudice to any other legal action, entitle the Department to cancel the contract either wholly or in part, and all or any other contracts with Contractor and recover from the Contractor such amount or the monetary value thereof and the amount of any loss arising from such cancellation without any entitlement or compensation to the Contractor. The Department will also have the right to recover any such amount from any contracts concluded earlier between the contractor and the Government of India. The contractor will also be liable to be debarred from entering into any contract with the Government of India for a minimum period of five years. A decision of the Department to the effect that a breach of the undertaking had been committed shall be final and binding on the Contractor.

3.32 Risk and Cost Purchase:

Timely delivery of goods/services is of prime importance and where the vendor fails to fulfil their contractual obligations, the Procuring Entity shall be entitled, and it shall be lawful on his part, to procure Stores and/ or services similar to those ordered/cancelled, with such terms and conditions and in such manner as it deems fit at the “Risk and Cost” of the Contractor and the Contractor shall be liable to the Procuring Entity for the extra expenditure, if any, incurred or accrued by the Procuring Entity for arranging such procurement. However, the Contractor shall not be entitled to benefits if any, from such procurement.

3.33 Bank Guarantee for Free Issue Material

As the FIM belongs to Govt. Of India, this will be issued to the successful tenderer against the submission of Bank Guarantee/FD from a nationalized bank for Rs: 50Lakh for Wheels and Rs 10Lakhs for Rails drawn in favour of Director, SDSC/SHAR and valid till completion of the entire scope of work and shall be returned as mentioned in Clause: B1, Point NO: 17.0 & 18.0

PROJECT INFORMATION

1.0	Project Title	: SSLV LAUNCH COMPLEX (SLC)
2.0	Location of Plant	: SSLV LAUNCH COMPLEX, SSLV PROJECT OFFICE, SURVEY NO. 260-3C, MADHAVANKURICHI VILLAGE – 628206, OPP. TO KOODAL NAGAR, THIRUCHENDUR TK., TUTICORIN DIST., TAMILNADU
3.0	Elevation	: 22 m
4.0	Access to Site	: Road about 21km from Thiruchendur and about 46km from Koodankulam approximately.
5.0	Terrain	: Uneven with level varying significantly.

6.0 Climatic Conditions

a) Temperature

Mean of daily max	:	34 ^{0}C
Mean of daily min.	:	28 ^{0}C
Maximum Temperature	:	39 ^{0}C
i. Design ambient temperature for performance guarantee	:	45.0 ^{0}C
ii. For electrical system design	:	50 ^{0}C

b) Relative humidity

i. Range	:	58% to 72%
ii. Design relative humidity for performance guarantee	:	80%

c) Rainfall

i. Annual average maximum	:	1222.7 mm

7.0 Wind Load

Basic wind speed	:	7m/s (Enhanced by a factor 1.4)

8.0 Seismic Data : As per IS : 1893 latest issue

	Zone	:	Zone II
9.0	Auxiliary Power Supply	:	Electrical equipment to be supplied against this specification shall be suitable for operation on the following supply system:

SECTION –B1

SCOPE OF WORK & TECHNICAL SPECIFICATION

1.0 SCOPE

This specification covers the general requirements for preparation/revision of drawings, supply of material, manufacture, testing, inspection at CONTRACTOR'S works, packing, forwarding, transportation, transit insurance, delivery at site, erection / installation, testing, commissioning at site and carrying out performance / acceptance tests of the equipment under the supervision of ISRO & Third Party Inspection Agency (TPIA), materials and services as per enclosed data sheets and other documents. The scope of work shall also include collection of free issue items (if any) from PURCHASER, assembling the same with manufactured items of VENDOR and despatching along with the final products.

2.0 BACKGROUND INFORMATION

2.1 After the assembly of launch vehicle on Mobile Launch Structure (MLS), the same is transported by a Wheel Bogie from SSLV Assembly Facility (SAF) to the Launch Pad (LP) for launching operation.

2.2 In SAF building, the MLS is positioned & anchored to Ground Anchors and the launch vehicle is assembled on MLS. When MLS with launch Vehicle has to be transported to launch pad, the Wheel Bogie is positioned under the MLS. There are Four Nos. of MLS Lifting Jacks resting on Wheel Bogie for lifting the "MLS & Vehicle". The bearing plates positioned between MLS and Ground Anchors are removed and then the MLS Lifting Jacks are lowered so that the "MLS & Vehicle" rests on the Bogie for transportation to launch pad. Wheel Bogie along with MLS and Launch Vehicle is moved on Single Rail Track by means of a Hauler moving on road paved between the Single Rail Track. A Reverse sequence is followed when "MLS & Vehicle" is to be anchored in launch pad area / parking area.

2.3 There shall be side tracks perpendicular to the main track at one location outside of SAF building for parking MLS. To facilitate the bogie system to travel on side track, it shall be equipped with axle turning arrangement. During axle turning operation, MLS will be unloaded on the ground anchors at track junction location. Then the bogie system shall be lifted by Bogie lifting hydraulic jacks to make sufficient clearance between wheels and tracks. Then bogie system shall be turned manually to align with the side tracks. At four junctions of the main and side tracks, four small piece of rail tracks shall be there, which can be align with any one-track directions (main & side). After aligning the small piece of tracks with side tracks, the bogie system will be lowered on the tracks and the MLS shall be lifted

and loaded on bogie system by operating MLS lifting hydraulic jacks. Finally, bogie shall be carrying the MLS and unload on ground anchors at parking location and vice versa.

3.0 EQUIPMENT AND SERVICES TO BE PROVIDED BY CONTRACTOR

The Equipment and Services for Wheel Bogie to be provided by the CONTRACTOR shall be inclusive of but not limited to the following items:

3.1 Wheel Bogie system (1 No.)

3.2 Collection of free issue items (Wheels (8nos) and rail track with fishplates and clips (if required for 48m length) from the DEPARTMENT (SDSC SHAR, Sriharikota) against Bank Guarantee / FD, packing, transportation to their works site, assembly with fabricated structure and transportation back to SLC site, Tamil Nadu.

3.3 Additional supports, lugs, Bolts and Nuts required during control assembly of modules at shop and prior to welding of modules at site.

3.4 Laying of 24m long Single Rail Track at vendor site (rail has to be levelled less than 0.5 mm and same to be ensured using laser tracker or equivalent instrument with accuracy ± 0.5 mm, and the same instrument will be used for checking bogie levels at vendor site for control assembly and at purchaser's site for final assembly) for Control assembly of the Wheel Bogie Structure. All accessories (including the rails) for laying / fixing Rail are in the scope of the CONTRACTOR.

3.5 Shop assembly, Erection, Inspection & Testing, Packing & Forwarding, transportation to site, unloading & storage at site.

3.6 Erection, Commissioning and Performance Testing of the Wheel Bogie system at site.

3.7 Minor Fabrication / improvement works on Wheel Bogie at site.

3.8 Painting of all equipment at CONTRACTOR's SHOP as well as at site as per the detailed specifications duly approved by the PURCHASER.

3.9 First fill of oil, grease, lubricants consumables, etc. as required during Start up and Commissioning operations.

3.10 Supply and erection of electrical systems as per clause 20.0

3.11 <u>PREPARATION / REVISION OF DRAWINGS AND DOCUMENTS:</u>

After the Award of CONTRACT, the PURCHASER shall provide a set of drawings for the proposed Wheel Bogie to the CONTRACTOR. The CONTRACTOR shall carry out preparation / revision of drawings in order to incorporate any subsequent modifications required in the drawings before and

during the manufacture of Wheel Bogie. Some of the conditions due to which modifications in drawings may be necessary are stated here below:

a) Preparation / Revision of drawings to incorporate the Technical Deviations / Design modifications proposed by the CONTRACTOR and accepted by the PURCHASER.

b) Preparation / Revision of drawings to incorporate modifications in the Wheel Bogie as specified by the PURCHASER after the award of CONTRACT.

c) Preparation / Revision of drawings to incorporate changes in Bought-out components.

d) Any other changes in the design / drawings for Wheel Bogie found necessary to be carried out during various stages of manufacture and erection of Wheel Bogie.

4.0 EQUIPMENT AND SERVICES TO BE PROVIDED BY DEPARTMENT

4.1 Rail for movement of Wheel Bogie at SLC site, Tamil Nadu

4.2 Eight number of wheels required for the bogie.

4.3 Mobile Launch Pedestal (MLS) for interface checks at DEPARTMENT's site after erection.

4.4 Towing Hitches for hauling Wheel Bogie along with MLS and Launch Vehicle will be provided at site. Towing Hitches shall be mounted by the CONTRACTOR on Front end, Rear end and one side of the Wheel Bogie.

4.5 Hauler for moving of Wheel Bogie on Single Rail Track shall be provided at DEPARTMENT's site during Commissioning and Performance Testing.

5.0 TECHNICAL SPECIFICATION OF WHEEL BOGIE

Approximate location of Bogies below MLS	One (1 no.) Each at four (4) corners of 6.5 m x 9 m rectangle
Span of Rail track	6.5 m centre to centre
Tread diameter of Wheels	1200 mm
No. of Wheels in each Bogie	2
Total No. of Wheels	8
Max. Wind speed	18 m/s during the movement of Bogie System 30 m/s in Stationary condition of Bogie System
Rail track	Rail Type MRS-85
Maximum acceleration / deceleration	0.03 m/sec^2

5.1 Bogie System

5.1.1 The Bogie System consists of four nos. of Bogie units located at the four corners of a fabricated Bogie Structure.

5.1.2 Bogie System consists of the following major Components:

a) Spacer Block
b) Interconnecting Structures with Jack support structure for bogie lifting jack mounting provision
c) Yoke
d) Balancer
e) Hinge pin
f) Axle
g) Wheels
h) Maintenance Platform
i) Hydraulic Jacking System for MLS lifting
j) Hydraulic Jacking System for Bogie lifting during Bogie turning operation

5.1.3 The Load acting on each of the four Bogie units shall be transferred to a set of two wheels by providing a Balancer System.

5.1.4 There shall be four Spacer Blocks provided on the Bogie System and these Spacer Blocks shall be interconnected by means of Interconnecting Structures. Provision shall be made inside the Spacer blocks for mounting of the MLS Lifting Jacks.

5.1.5 The Spacer Block shall be connected to the Yoke and this Yoke shall be in turn connected to the Balancer through a Hinge Pin.

5.1.6 A suitable bearing arrangement shall be provided between the Spacer Block and the Yoke so that the Balancer and the Yoke system along with the two wheels can swivel about the Bogie centreline. This freedom of swivelling motion shall be provided so that the wheels can swivel when the Bogie passes over the curved track.

5.1.7 There shall be eight vertical structures from interconnecting structures. Provision shall be made for mounting Bogie lifting jacks below the vertical structures for lifting and lowering the bogie system alone.

5.1.8 The Wheels of the Bogie is double flanged type.

5.1.9 The Interconnecting Structures are connected through Cross Beams / Connecting Beams. Provision shall be made on the Front end, Rear end and side of the Bogie for mounting of Towing Hitches at appropriate locations on Hauler interface structure. The Trailer Hitch will be connected to the Hauler by means of a Tow bar which will be supplied by the Hauler manufacturer.

5.1.10 A Maintenance platform shall be provided on the two sides of the Bogie structure. The access to the Maintenance Platform shall be provided from the sides of the Bogie. Maintenance platform is used for the mounting of the hydraulic Power Pack for the MLS lifting Jacks & other equipment

5.1.11 4no.s of 300t hydraulic jacks for lifting and lowering of MLS and 8 nos. pf 30t hydraulic Jacks for lifting and lowering of bogie, along with hydraulic power packs will be mounted on bogie system. Supply of hydraulic jacks and power pack system is not in the scope of contract.

5.1.12 Standard practices to be followed for ultrasonic testing for forged items:

1) Standard practice for fabrication and control of reference blocks used in ultrasonic inspection, ASTM E428.
2) Standard practice for ultrasonic examination of heavy steel forgings ASTM A388 / A388 M.
3) For evaluating characteristics of ultrasonic pulse echo testing system and ultrasonic search units, standard practices stated in ASTM E317 and E1065 shall be followed.

5.1.13 Ultrasonic testing:

1) Scanning shall be carried on two sides of the object.
2) Full surface scanning shall be carried out with adequate overlap in line scans.
3) All the recordable defect indications shall be preserved and reported.

5.1.14 Acceptance criteria:

1) Extensive discontinuities are not acceptable.
2) Grouped discontinuities greater than reflection represented by 4mm FBH are not acceptable.
3) Regular / isolated discontinuities greater than reflection represented by 6mm FBH are not acceptable.
4) Defects characterised as lack of material having dimension more than 3mm are not acceptable

A brief description of Constructional features of the major components of Bogie system are listed below:

5.2 Spacer Block

5.2.1 There are four Spacer Blocks provided on the Bogie System and these Spacer Blocks are interconnected by means of Interconnecting Structures, Connecting beams and Cross beams.

5.2.2 Raw material shall be tested for its chemical & mechanical properties for at least one sample piece for each batch of heat.

5.2.3 Raw material shall be ultrasonically tested.

5.2.4 Liquid penetration test shall be carried out as per, Section-V of ASME on root & final run of all full penetration welds.

5.2.5 100% Magnetic particle test shall be carried out as per section-V of ASME on welds.

5.2.6 UT of welds shall be examined as per Section-V of ASME.

5.2.7 All the butt welds are to be qualified using RT.

5.2.8 Details of dimensional inspection checks to be carried out and surface finish to be achieved shall be submitted to PURCHASER for approval.

5.2.9 Finish machining after heat treatment to be subjected to fluorescent dye penetration test as per ASTM A 275.

5.3 Structures of Bogie System

5.3.1 Bogie System consists of Interconnecting structures, Cross beams, connecting beams, vertical structure for mounting bogie lifting jacks and Hauler interface structure. All the above items are of welded construction and are fabricated from plates / rolled sections.

5.3.2 The Interconnecting Structures of Bogie System (having welded construction) are bolted / doweled together with Spacer Blocks, connecting beams, Cross beams, etc. in the VENDOR's shop to complete the control assembly of Bogie System.

5.3.3 Each interconnecting structure is a combination of box type girders, which are individually fabricated and then assembled with Spacer Blocks, connecting beam, Cross beam and subsequently welded at site. Interconnecting structure shall be stress relieved. Stringent tolerances shall be achieved for each module as specified in the drawings.

5.3.4 Provision for mounting of Towing Hitches on Hauler Interface structure shall be made on Front end, Rear end and side face of the Bogie System.

5.3.5 Drilling on all the flanges of Connecting beams shall be done in assembled condition with interconnecting structure.

5.3.6 Raw material shall be tested for its chemical & mechanical properties for at least on one sample piece for each batch of heat for each component.

5.3.7 Raw material shall be ultrasonically tested.

5.3.8 Weld joints shall be thermally stress relieved.

5.3.9 Liquid penetration test shall be carried out as per Section-V of ASME on root & final run of all full penetration welds and for all other welds after final run.

5.3.10 100% Magnetic particle test shall be carried out as per Section-V of ASME on welds.

5.3.11 UT of welds shall be examined as Section-V of ASME.

5.3.12 All the butt welds are to be qualified using RT.

5.3.13 Details of dimensional inspection checks to be carried out and surface finish to be achieved shall be submitted to PURCHASER for approval.

5.3.14 Finish machining after heat treatment to be subjected to fluorescent dye penetration test as per ASTM A 275.

5.4 Yoke

5.4.1 Four Nos. of Yokes are required for the Bogie System.

5.4.2 Raw material shall be tested for its chemical & mechanical properties for at least on one sample piece for each batch of heat.

5.4.3 Raw material shall be ultrasonically tested.

5.4.4 Weld joints shall be thermally stress relieved.

5.4.5 Liquid penetration test shall be carried out as per, Section-V of ASME on root & final run of all full penetration welds.

5.4.6 100% Magnetic particle test shall be carried out as Section-V of ASME on welds.

5.4.7 UT of welds shall be examined as per Section-V of ASME.

5.4.8 All the butt welds are to be qualified using RT.

5.4.9 Details of dimensional inspection checks to be carried out and surface finish to be achieved shall be submitted to PURCHASER for approval.

5.4.10 Finish machining after heat treatment shall be subjected to fluorescent dye penetration test and as per ASTM A 275.

5.5 Balancer

5.5.1 Four Nos. of Balancers are required for the Bogie System.

5.5.2 Raw material shall be tested for its chemical & mechanical properties for at least on one sample piece for each batch of heat.

5.5.3 Raw material shall be ultrasonically tested.

5.5.4 Dimensional accuracy required for dimensions without tolerance shall be as per DIN 8570-1987.

5.5.5 Weld Joints shall be thermally stress relieved.

5.5.6 Liquid penetration test shall be carried out as per Section-V of ASME on root & final run of all full penetration welds.

5.5.7 100% Magnetic particle test shall be carried out as per Section-V of ASME on welds.

5.5.8 UT of welds shall be examined as per Section-V of ASME.

5.5.9 All the butt welds are to be qualified using RT.

5.5.10 Details of dimensional inspection checks to be carried out and surface finish to be achieved shall be submitted to PURCHASER for approval.

5.5.11 Finish machining after heat treatment shall be subjected to fluorescent dye penetration test and as per ASTM A 275.

5.6 Hinge Pin

5.6.1 Four Nos. of Hinge pins are required for Bogie System.

5.6.2 Raw material shall be tested for its chemical & mechanical properties for at least on one sample piece for each batch of heat.

5.6.3 The forging shall be ultrasonically tested as per ASTM-A-388M

5.6.4 Finish machining after heat treatment shall be subjected to Fluorescent Dye Penetration Test and Magnetic Particle Test as per ASTM-A-275M

5.6.5 The forging shall be normalised, quenched & tampered to achieve a hardness of 180-215 BHN & other mechanical properties as per ASTM A 668

5.6.6 All Dimensions to be achieved subsequent to finish machining.

5.7 Axles

5.7.1 Eight Nos. of Axles are required for Bogie System.

5.7.2 Raw material shall be tested for its chemical & mechanical properties for at least on one sample piece for each batch of heat.

5.7.3 The forging shall be ultrasonically tested as per ASTM-A-388M

5.7.4 Finish machining after heat treatment shall be subjected to Fluorescent Dye Penetration Test and Magnetic Particle Test as per ASTM-A-275M

5.7.5 The forging shall be normalised, quenched & tampered to achieve a hardness of 180-215 BHN & other mechanical properties as per ASTM A 668

5.7.6 All Dimensions to be achieved subsequent to finish machining.

5.8 Wheels

5.8.1 Wheels shall have a tread diameter of 1200 mm and double flanged.

5.8.2 **Ø1.2m wheel will be given as free issue material to the qualified party by SDSC SHAR. Refer section-B1, 17.0 for terms and condition regarding free issue of wheels.**

5.8.3 Eight number of wheels shall be fitted to the bogie system.

5.8.4 Bogie system will be travelling in straight track and curved track (of radius R300m) as well.

5.8.5 The wheel is fitted to the dead axle of bogie with one double row taper roller bearing as per the drawing.

5.8.6 The maximum rpm of the wheel is 3.

5.8.7 Material for the wheels is 42CrMo5-04.

5.9 Bearings:

5.9.1 Inspection reports and test certificates for the supplied bearings shall be submitted along with supplies

5.10 Maintenance platform:

Maintenance platform located on two side of Bogie System shall be fabricated at site.

6.0 INTERFACING SYSTEM FOR BOGIE SYSTEM:

6.1 MOBILE LAUNCH PEDESTAL (MLS)

The Launch vehicle will be assembled on MLS. In SAF building, the MLS is positioned & anchored to Ground Anchors and Launch vehicle is assembled on it. When the MLS with Launch Vehicle in assembled condition is to be transported to launch pad, the Bogie System is brought under the MLS. The four MLS lifting jacks mounted on the Bogie System lift the “MLS with Launch

Vehicle". The Bearing plates located between the MLS and Ground Anchors are removed and then the MLS lifting jacks are lowered. Subsequently, at the interface of MLS with Bogie System, Fasteners shall be assembled between Bogie System and MLS so that the MLS & Launch Vehicle rests on the Bogie System for transportation of the Launch vehicle to launch pad. The MLS and the fasteners (required to be mounted at the Bogie-MLS interface) will be provided by the PURCHASER. Interfaces on the Bogie System for these items shall be provided by the CONTRACTOR.

6.2 HAULER TOWING HITCH

The Bogie System will be connected to the Hauler by means of Tow bar and Towing Hitches. The towing Hitches will be provided by the PURCHASER. Interfaces for mounting of Towing Hitches shall be provided by the CONTRACTOR on Front end, Rear end and side face of the Bogie System for connection of Tow bar from the Hauler.

6.3 MLS LIFTING JACKS WITH HYDRAULIC POWERPACK

Four nos. of 300t capacity Double Acting Hydraulic Jacks are used for lifting MLS on the Wheel Bogie. The jacks are located inside the four Spacer Blocks of the Wheel Bogie. All four jacks are connected by means of interconnecting piping to the Hydraulic Powerpack located on the Wheel Bogie structure. Supply of MLS lifting hydraulic jacks & powerpack is not in the scope of contract.

6.4 BOGIE LIFTING JACKS

Eight nos. of 30 t capacity Double Acting Hydraulic Jacks are used for lifting Bogie system on the Jack support structure of Wheel Bogie. The jacks are located below the eight nos. of jack support structures. All eight jacks are connected by means of interconnecting piping to the Hydraulic Powerpack (common hydraulic power pack for 300t & 30t hydraulic jacks) located on the Wheel Bogie structure. Supply of Bogie lifting hydraulic jacks is not in the scope of contract.

7.0 BOUGHT OUT ITEMS FOR BOGIE SYSTEM

All bought out items shall be procured and assembled with Bogie System. The Preliminary Technical Specification of various Bought out items of Bogie System are listed below:

Sl. No.	Components	Specification	Total Qty In nos.
1.	Double Row Taper Roller Bearing	Type: HM 256849/ HM256810CD Make: TIMKEN	8
2.	Spherical roller thrust bearing	Type: 29352E Make: SKF	4
3.	Spherical roller bearing	Type: 23076 CC/W33 Make: SKF	4
4.	Spherical roller bearing	Type: 23088 CC/W33 Make: SKF	4
5.	Rothe Erde Slewing Bearing	Single row four-point bearing Standard series type 625, Normal Bearing Bearing No: 060.25.0855.500.11.1503 Make: ROTH ERDE, Series: 06 (Note: If the specified bearing is not available in the market, an equivalent bearing shall be used after clearance from the department.)	4

8.0 Manufacturing, assembly, testing and inspection

8.1 General instructions

The general instructions for fabrication are specified in the subsequent clauses.

8.1.1 All rolled steel sections before being used for fabrication shall be clean, free from bends, twists, etc. and straight within tolerances specified by IS: 1852 – 1985. If straightening or flattening is necessary, it shall be done by methods that will not injure the material. Long plates shall be straightened by passing

through a mandrel or levelling rolls and structural shapes by the use of mechanical or hydraulic bar/section straightening machines. Heating or forging shall not be resorted to without the prior approval of the PURCHASER in writing. In case of site fabrication, CONTRACTOR shall obtain PURCHASER's approval in writing on the straightening method proposed to be adopted before commencing the work.

8.1.2 Welding shall be performed as per IS: 9595.

8.1.3 All welding shall be carried out by qualified and approved welders in accordance to ASME Sec IX.

8.1.4 Edge preparation shall be carried out for all plates before welding. For butt-weld joints, edge preparation shall be preferably done by machining and may be done by mechanically controlled gas cutting machine. Sub surfaces shall be ground, cleaned and inspected before fitting / welding.

8.1.5 Unless otherwise specified on drawings, all butt welds shall be full penetration welds.

8.1.6 Unless otherwise specified on drawings, all fillet welds shall be 50% of the minimum plate thickness and shall be on both sides of the plate. Also, the weld shall be continuous.

8.1.7 Welding sequence shall be such that the distortion and residual stresses are minimised. All welds shall be deposited in proper sequence so as to balance the applied heat as far as possible. (A wandering sequence shall be used whenever necessary).

8.1.8 The procedure to be followed by CONTRACTOR for all weld repairs shall be subject to approval by the PURCHASER.

8.1.9 Stress relieving shall be carried out for all fabricated components prior to its machining.

8.1.10 All sharp corners of machined / fabricated items shall be smoothened by de-burring, hand grinding, chipping and filing.

8.1.11 Fabricator employed at site shall have adequate machining, welding, metrology and portable NDT facilities.

8.1.12 All fabrication work undertaken in parts shall bear distinct match marking to facilitate further identification and erection.

8.1.13 During manufacturing, assembly, erection and commissioning, bolt tightening shall be carried out using torque wrench / impact wrench to ensure required tightening / tension in the bolts.

8.2 Manufacturing instruction

8.2.1 The VENDOR shall arrange to procure the raw materials, manufacture, assemble, test and inspect the Bogie System at his shop and site as stated in the subsequent clauses.

8.2.2 VENDOR shall make necessary arrangements for carrying out various tests at his shop. After completion of testing of Control assembly at VENDOR's shop. After getting pre delivery inspection clearance from department, the Bogie System shall be dismantled with proper match marking and various individual components and assembled at SLC site.

8.2.3 The four Interconnecting Structures shall be bolted / dowelled with Spacer Blocks, connecting beams, Cross beams, etc. and subsequently welded. The post weld heat treatment of weld joints shall be carried out in-situ at site.

8.2.4 The VENDOR shall furnish welding procedure and the method of carrying out post weld heat treatment for various components of Bogie System to the PURCHASER for his review and approval. Also, Preliminary welding procedure and methods for carrying out post weld heat treatment shall be enclosed along with the BID.

8.2.5 All Free issue items supplied by PURCHASER for shop as well as site assembly shall be assembled and tested by the CONTRACTOR.

8.2.6 The records of all the tests carried out at VENDOR's shop shall be maintained and furnished to the PURCHASER for reference.

8.2.7 VENDOR shall submit schematic diagram envisaged for assembly and testing of

Bogie System.

8.2.8 WPS for welding of components like Bogie structures, Spacer Blocks, Balancers, Yokes, etc. shall be furnished in his BID. WPS for Bogie Interconnecting Structure shall also be taking into account the welding of dissimilar materials.

8.2.9 VENDOR shall submit fabrication procedure / fabrication plan / shop welding plan of Bogie Structures, Yokes, Spacer Blocks, Balancers, etc. indicating stages of carrying out UT or RT (as per drawing), considering accessibility of weld joints.

8.2.10 Process sheet of various manufacturing activities shall indicate Quality milestones for carrying out various Quality Control activities before start of next manufacturing activity.

8.3 Machining

8.3.1 Yokes & Balancers of the Bogie shall be machined separately maintaining the geometrical tolerance and then taken up for assembly.

8.3.2 In-line boring of the hubs in the Yoke (for mounting of Hinge Pins) is to be ensured with reference to their Top surface.

8.3.3 While machining Spacer Blocks, some machining stock is to be left over on the top and bottom surface, which shall be finally machined after welding with the Bogie Structure in modules, maintaining geometrical tolerances as specified in the drawings. Complete Bogie Structure shall be assembled, bolted and dowelled maintaining top surface of Spacer Blocks in one level within tolerance as specified in the drawings by selecting appropriate assembly methodology.

8.4 Instructions for Bearing Fitting

Before the starting of mounting a bearing, ensure that the shaft and bearing housing are within the stipulated tolerances. Ensure that the contact between bearing OD and the housing bore is minimum 80%.

Bearing for fitting shall be heated in oil or induction heating shall be carried out. The bearing shall be fully immersed in the heated-up oil bath. Transformer oil shall be used as heating medium. The container shall be cleaned and designed to ensure that the bearing does not come in direct contact with the heated

surface. Bearing shall be heated to above 80-90˚ C. The expansion of bearing bore shall be ascertained using gauge for proper fitting of the bearing on the shaft. The bearing shall be held properly against the shaft shoulder until it cools and grips the seating.

Protection of bearing after mounting: when the bearing is mounted, seal must not be left uncovered as foreign particles may get into the bearing. The bearing shall be properly covered with grease paper or 0.5mm thick polythene paper.

8.5 Assembly Sequence at CONTRACTOR's Shop

The items / components / sub-assemblies shall be erected / mounted in the following sequence. However, the sequence may be altered based on site condition and local constraints, which cannot be envisaged now.

1. Align and grout Rail Track of 48 meters length for erection of Bogie System at shop for control assembly.
2. Place four Bogies (consisting of the assembly of wheel, Axle, balancers, Yokes, Spacer Block) on Rail Tracks using mobile crane, one after the other with proper support.
3. Align four bogies on Rail Track as per the drawings positioning them to 6.5 m x 9 m rectangle.
4. Assemble Interconnecting Structures to their respective Bogies using mobile crane.
5. Align Bogie Interconnecting Structure using temporary supports and inspect all the dimensions and then fasten the bolts between Spacer Block and Interconnecting Structure. (Spacer Block and Interconnecting structure shall be rigidly aligned to each other by using temporary lug supports (cleats) which are to be welded on all sub-systems as required).
6. Test run the Bogie System on track using winch mechanism.
7. Mark all the match marking points on the sub-systems of the Bogie System.
8. Dismantle all the sub-systems after inspection / testing and dispatch to site for erection.

The BIDDER shall furnish the assembly testing program / scheme with the offer.

9.0 ERECTION, TESTING & COMMISSIONING

9.1 Erection of Bogie System at Site

9.1.1 Pre-requisites

Rail track for at least 100 m length fully aligned and ready to take up erection of the Bogie System assembly on Tracks at site shall be under PURCHASER scope.

9.1.2 Transportation and Temporary Placement

Transportation of all the bogie items from the storage place to the erection site and unloading at a place designated for the purpose of erection is under the scope of Vendor.

9.1.3 Basic Methodology and Scaffolding / Lifting Arrangements

The basic methodology lies in the understanding of the CONTRACTOR to devise temporary means of material lifting and supporting to align segments, bolting / welding & stress relieving as per drawing to complete the Bogie System assembly.

For installation of Bogie System, one or more mobile cranes of adequate capacity shall be deployed at site by the CONTRACTOR. The support structure required for installation shall be fabricated at site for proper alignment of different segments.

All tools, tackles & material handling equipments required during various stages of execution of project right from manufacture at shop to the erection and testing at site shall be in the scope of the CONTRACTOR.

9.1.4 Installation Procedure / Erection Sequence

1) The equipment delivered at site shall be inspected and checked as per the packing list for ensuring availability of complete list of components / materials.

2) All Sub-assemblies / Components shall be cleaned and the corrosion preventing coating, if applied shall be removed from surface of the components. The components which are delivered in dismantled condition shall be cleaned prior to their assembly.

3) The CONTRACTOR shall submit documents depicting Fabrication and Erection Procedure at site, Alignment Sequence, details of Trial / Test Runs to be conducted at site without and with MLS mounted on Bogie System, based on the guidelines indicated in this document.

4) The Centerlines & benchmarks shall be checked and established in suitable place for easy reference.

5) The sub-assemblies shall be dismantled and all the antifriction bearings, if necessary, shall be thoroughly re-visited and lubricated prior to assembly.

6) The items / components / sub-assemblies shall be erected / mounted in the following sequence. However, the sequence may be altered due to site condition and local constraints, which cannot be envisaged now.

7) The four Bogies (consisting of the assembly of Wheel, Axle, Balancers, Yokes, etc.) are to be positioned on the existing Rail Track at site by using Mobile Crane. The Bogies are to be positioned at the corners of a 6.5 m x 9m rectangle within required tolerance specified on the drawings.

8) The Interconnecting Structures are to be assembled on the Bogie using Mobile crane and are to be positioned suitably on temporary supports.

9) The Cross beams / Connecting beams, Interconnecting Structures & Spacer Blocks are to be bolted and subsequently welded in position so as to create the integral Bogie structure.

10) The Maintenance platform located on the two sides of the Bogie is to be fabricated and erected on the Bogie structure.

11) The Hydraulic Power Pack and the MLS lifting Jacks are to be mounted on the Bogie and connected by means of interconnecting piping. This is in purchaser's scope.

12) The Electrical panels and cables (if any) are to be mounted on the Bogie System as per Clause 20.

13) The Parking Brakes are to be mounted on the Bogie System.

14) The Trailer Hitches are to be mounted at the Front end, Rear end and side face of the Bogie System.

15) Test runs the Bogie System on both straight and curved track using Hauler system shall be carried out. Hauler is in the scope of department.

16) Check operation of all the four Nos. of 300t and eight nos. 30t capacity Hydraulic Jacks.

17) Test run of the axle turning by lifting the bogie system using 30t hydraulic jacks.

9.2 TESTING

9.2.1 Testing of Bogie System at CONTRACTOR's Shop

1) Each major sub-assembly shall be inspected and approved for final assembly by ISRO / TPIA before being mounted on Bogie System.

2) The following tests shall be carried out at VENDOR's works in presence of ISRO / TPIA:

   a) Levelling and alignment of temporary Rail track erected at shop.

   b) Rectangularity and centre to centre distances at the four Bogies.

   c) Distance of top surface of Spacer Block from the Rail top.

   d) All control dimensions of the Bogie System assembly.

   e) Smooth To and Fro Movement of complete Bogie system through a distance of 10 m for at least 5 times. Movement of Bogie System shall be checked using suitable Winch mechanism.

9.2.2 Testing of Bogie System at site

a) Rectangularity and center to center distance of individual Bogies.
b) Distance of top surface of the Spacer Blocks from Rail top (without MLS).
c) Smooth movement of complete Bogie System (without MLS) on Rail track using Hauler.

d) Checking the movement of Bogie System (without MLS) on a Curved Track.
e) Checking the operation of four MLS Lifting Jacks. This is in purchaser's scope.
f) Checking the operation of Parking Brakes installed on the Bogie System.
g) Checking the assembly of MLS on Bogie.
h) Load testing of Bogie System with MLS.
i) Checking the Lifting of MLS by the Hydraulic Jacks. This is in purchaser's scope.
j) Test run of Bogie System along with MLS at rated speed using Hauler on straight Track.
k) Testing of the movement of the Bogie System along with MLS using Hauler on curved Track.
l) Testing of the transfer of Support of MLS from Bogie to Anchor legs and the withdrawal of the Bogie System using Hauler.
m) Checking the lifting of Bogie system alone by using bogie lifting hydraulic hacks and smooth rotation (by 90 degree) of axles for axle turning operation.

9.3 Commissioning (functional checks with MLS)

After complete testing & evaluation of Systems, Commissioning activities will be carried out by ISRO. During commissioning trials, CONTRACTOR's responsibility is limited to participation in the trials by deputing his representative to ensure that the installation of Bogie System shall perform to the expected level as per the Specification, standards and procedures stipulated in the CONTRACT. The CONTRACTOR shall ensure to attend to the defects noticed if any and rectify the same for future continuation of work during the trails.

The commissioning activity includes the following:

1. Load testing of Bogie System with MLS weighing 300t. Strain to be measured and extrapolated to 480t.
2. Test run of Bogie System with MLS on straight and curved track using Hauler, accurate positioning of MLS at parking locations, transferring the MLS from Bogie Systems to Anchors and withdrawal of Bogie System.

9.4 Accuracy Requirements to Be Fulfilled By Bogie Structure

Accuracy requirements to be fulfilled by Bogie structure during control assembly at shop and after erection at site are as follows:

9.4.1 Centre to center distance between any two adjacent Bogies across the rail tracks shall be within **6500 ± 1**mm and centre to center distance between any two adjacent Bogies along the rail tracks shall be within **9000 ± 1**mm**.**

9.4.2 Rectangularity of the Bogie system (i.e., The difference in the two Diagonal Centre to Centre distances of the Bogies) shall be within **2 mm.**

9.4.3 Distance from top of Rail to top surface of Bogie System shall be within **2210± 1** mm**.**

10.0 Codes and Standards

10.1 All equipment, system and services covered under this Specification shall comply with all currently applicable statutes, regulations and safety codes. Nothing in this Specification shall be construed to relieve the BIDDER of his responsibility.

10.2 The standards not indicated in the Specification are also acceptable, if they are established to be equal or superior to the standards indicated in the Specification.

10.3 The metric units / SI units shall be used in all data / drawings submitted against this Tender.

10.4 The BIDDER shall furnish the English translations of all standards to which the equipment and systems offered are conforming to, as and when required by the PURCHASER.

10.5 In the event of any conflict between the Codes and the Standards referred to elsewhere in the Specification and the requirements of this Specification, the more stringent of the two shall govern.

10.6 The latest issue of IS codes prevailing at the time of submission of final offer shall be applicable. However, if there are any revisions during the execution of the

CONTRACT, the same shall be applicable and the cost implication, if any, shall be mutually discussed

10.7 The Bogie shall comply with the requirements of the following codes and standards:

Steel for general structural purposes	IS 2062
Rolled Sections and Special sections	IS 808, IS4923.
Interconnecting Structure, Balancer, Spacer block, Yoke, Bearing retainer, etc.	ASTM SA 517, 40Ni6Cr4Mo3
Hinge Pins, Axles , etc.	ASTM A 668 Class F (forged)

Note:

1. If the specified material is not available in the market, an equivalent material shall be used after clearance from the department.

2. For ASTM SA 517 Grade-F, following equivalent material may be selected as an alternative material : S690QL and STRENX 700E

11.0 RELIABILITY AND QUALITY ASSURANCE PLAN

11.1 The inspection procedures shall be categorized as follows

(a) Category A: Stage wise and final inspection including review of documents by Department.

(b) Category B: Stage wise and final inspection including review of documents by the CONTRACTOR. DEPARTMENT shall perform final inspection and review documents.

(c) Category C: Final inspection and review of documents shall be carried out by the CONTRACTOR. DEPARTMENT shall carry out the final review of documents.

11.2 The minimum requirements for ensuring quality at various stages are spelt out below. However, the reliability and quality assurance plan shall be prepared by the VENDOR and shall be reviewed and approved by DEPARTMENT.

11.3 The following are the basic Inspection requirements to be followed upon receipt of raw material:

Review of material test certificates	Category C
UT of plates for thickness greater than 20 mm	Category C

11.4 The following are the minimum in-process tests that shall be carried out:

Welding procedure & welder / welding operator's performance qualification	Category C
100% MT / PT for flame cut edges for plate thickness exceeding 38mm.	Category B
100% PT after back gouging	Category B
100% UT / RT for full penetration welds	Category A
100% MT / PT for full penetration welds after final pass	Category A
100% MT / PT for fillet welds after final pass	Category A
100% MT / PT for fillet welds between tension flanges & webs.	Category A
100% UT for forgings	Category A

11.5 Heat treatment shall be carried out on the following:

For carbon steel plates where thickness exceeds 20 mm.	Category C
All other components as referred to in the drawings.	Category C

11.6 The following are the final inspection / tests that shall be carried out:

Visual and dimensional inspection of components / sub - assembly	Category A
Blue matching for bolted components	Category A
Control assembly of Bogie System at Vendor's shop and testing for Performance requirements	Category A
Complete assembly of Bogie System at site and testing for Performance requirements	Category A

12.0 INSPECTION AND TESTING PROCEDURES AND SCOPE OF INSPECTION

12.1 Raw Material Inspection shall be carried out at the VENDOR's works for compliance of the raw materials to the specified standards.

12.2 Bought out components shall be inspected either at VENDOR's works or at the SUB-CONTRACTOR's premises for compliance with the Specifications.

12.3 Fabricated components shall be inspected at the VENDOR's works for compliance with the component drawings. Sub-Assemblies shall be inspected at the VENDOR's works for compliance with the Sub-Assembly drawings and for performance requirements. Also, full Assembly of the Bogie System shall be inspected at VENDOR's works after shop assembly for compliance with assembly drawings and performance requirements.

12.4 The Third-Party Inspection Agency shall report to the PURCHASER technically for all Inspection works and shall meet all the requirements specified by the PURCHASER.

12.5 Full Assembly of the Bogie System shall be inspected at PURCHASER's premises after site assembly for compliance with the Assembly Drawings and Performance requirements.

12.6 After the award of CONTRACT, CONTRACTOR shall prepare detailed Quality Assurance Plan (QAP) for inspection & testing of all subassemblies / components of the Bogie System. The QAP shall be reviewed and approved by the Third-Party Inspection Agency and the PURCHASER. Indicative QAPs for Bogie System are enclosed in Section D1 respectively of this Specification.

12.7 The procedure to be followed for testing the accuracy requirements for the top surface of the Bogie System shall be as prepared by the CONTRACTOR and the same shall be submitted to the PURCHASER for review and approval.

12.8 All measuring and testing instruments / equipment required for carrying out all tests at VENDOR's works and at PURCHASER's site shall be provided by the CONTRACTOR.

12.9 CONTRACTOR shall furnish calibration certificates for the instruments to be used for testing at shop and site. The calibration certificates furnished by the CONTRACTOR shall not be more than 12 months old.

13.0 ACCEPTANCE TEST

13.1 After the entire installation work has been completed, the CONTRACTOR shall make all required adjustments until all Guaranteed Performance requirements are met. All instruments, services required for the above tests shall be furnished by the CONTRACTOR.

13.2 If the stipulated performance requirements are not fulfilled, the CONTRACTOR shall make good the deficiency by providing it in every case, by altering and / or replacing the parts or the whole equipment / system free of charge to the PURCHASER immediately. All rejected equipment shall be removed from the site at CONTRACTOR's expense.

14.0 SURFACE PREPARATION AND PAINTING

The painting of Bogie System shall be carried out as per Section B2 of this Specification as well as the PURCHASER's specific instructions for painting after the Award of CONTRACT.

15.0 DOCUMENTS TO BE SUBMITTED BY CONTRACTOR AFTER AWARDING CONTRACT

15.1 Schedule of Assembly & Detailed drawings and documents to be submitted for review & approval with submission dates.

15.2 Quality Assurance Plan (QAP)

15.3 Bar chart for supply & erection schedule indicating the date of completion of various activities so as to complete execution of the Contract within the time frame stipulated in the LOI / Purchase Order.

15.4 Progress Reports

15.5 Erection, start-up, operation and maintenance manual complete with lubrication schedule etc.

15.6 As-built drawings.

15.7 Quality Assurance documentation compiled for the project.

15.8 Other drawings and documents as specified under various sections of this tender.

15.9 The above list of documents is indicative and not exhaustive. The CONTRACTOR shall submit documents as specified in various sections of this Specification and also as per the specific instructions of the PURCHASER.

16.0 FINAL DOCUMENTS

16.1 CONTRACTOR shall submit the copies of operation and maintenance manuals well before the despatch of the equipment. The manual shall be in sufficient detail with step-by-step instructions to enable others to Inspect, erect, commission, maintain, dismantle, repair, reassemble and adjust all parts of the equipment. Each manual shall also include a complete set of approved as built drawings together with performance / rating curves / charts of the equipment, maintenance schedule and test certificates wherever applicable.

16.2 CONTRACTOR shall submit all the raw material test certificates, Ultrasonic testing of the raw material, Ultrasonic / radiography test certificates of all necessary welds, Stress relieving Charts, Hardness test certificates and Dimensional inspection reports of individual components

16.3 Quality assurance documentation compiled for the project.

17.0 Terms & conditions regarding free issue of wheels

17.1 8 numbers of Ø1.2m wheels will be given as free issue material to qualified party. Wheels shall be assembled to bogie system. Weight of each wheel is 1.2t approximately.

17.2 Party shall submit a bank guarantee or fixed deposit of 50 lakhs rupees for collection of 8 no.s wheels from department and shall be valid till receipt of the wheels bogie system at SLC site, Tamil Nadu.

17.3 Dimensional inspection of wheel (i.e., wheel to axle bearing interface), Ultrasonic test and Dye-penetrant test shall be carried out by the party at SDSC-SHAR site before transportation, in the presence of departmental person.

17.4 Upon clearance by the department, wheels shall be transported from SDSC SHAR to party site with utmost safety and care.

17.5 Dimensional inspection of wheel (i.e., wheel to axle bearing interface), Ultrasonic test and Dye-penetrant test shall be carried out by the party at vendor site after safe transportation, in the presence of approved third party agency. Party shall arrange for inspection within 1 week from date of receipt of wheels. Detailed report shall be submitted to department.

17.6 Dimensional Inspection, ultrasonic testing, dye-penetrant testing, arrangement of third-party inspection, packing and transportation of wheels from SDSC SHAR to party site, is under the scope of party.

17.7 All the wheels shall be properly coated with zinc primer and polyurethane top coat and packed properly after NDT.

17.8 Party is responsible for any damage to wheels during transportation, handling and assembly activities. In case of any damage, party shall replace the damaged wheel with new wheel at his own cost.

17.9 For any reason, if party wants to replace any of the already collected wheels, with the stand by wheels available in SDSC SHAR, party shall transport the rejected wheel back to SDSC SHAR and then transport the stand by wheel available in SDSC SHAR to party’s site. Packaging and transportation cost is under the scope of party.

18.0 Terms & conditions regarding free issue of Rails system

18.1 4 numbers of rails of each length 12m along with rail clips and fishplates will be given as free issue material to qualified party. Rails shall be grouted in the party's site for qualification of bogie.

18.2 The rail track shall be grouted over a surface such that the foundation shall not settle during control assembly of the bogie system at vendor's site.

18.3 Party shall submit a bank guarantee or fixed deposit of 10 lakhs rupees for collection of 4 no.s rails from department and shall be valid till receipt of the rails at SDSC-SHAR, Sriharikota.

18.4 Upon clearance by the department, rails shall be transported from SDSC SHAR to party site with utmost safety and care.

18.5 All the rails shall be properly coated with zinc primer and polyurethane top coat and protected against corrosion.

18.6 Party is responsible for any damage to rails during transportation, handling and assembly activities. In case of any damage, party shall replace the damaged rails with new rails at his own cost.

18.7 For any reason, if party wants to replace any of the already collected rails, with the stand by rails available in SDSC SHAR, party shall transport the rejected rails back to SDSC SHAR and then transport the stand by rails available in SDSC SHAR to party's site. Packaging and transportation cost is under the scope of party.

18.8 Party has to send back the rails to SDSC-SHAR, Sriharikota after completion and dispatch of bogie system. Packaging and transportation cost is under the scope of party.

19.0 Electrical and Control System

19.1 Scope

Supply includes to meet the functional requirement bogie.

a. Power to be taken care for lighting requirement of Bogie and auxiliary power

requirement as per the user defined loads.

b. Control to be taken care for the lighting and auxiliary powers.

All the electrical equipment should conform to latest standard BIS codes and the practices followed for design, installation, testing, commissioning, operation and maintenance. The supplier shall submit all the relevant test certificate to ISRO.

19.2 Electrical Equipment Environment

a) Items supplied should be suitable for Hazardous Area: Zone1, Gas Group IIA/IIB, T4 as per IS 5572, IS 5571, IS 2148 and IS 5780 or equivalent IEC 60079-1:2001 and IEC 60079-0:2004 standards.

b) Item supplied should be suitable for tropical and humid climate: Temperature of 50°C & RH not less than 95%.

c) De-rating: All the drive motors, power cables etc., shall be done for ambient temperature of 50°C and height factor wherever applicable as decided by the department.

d) Item supplied should be suitable for the following power supply variation: Voltage ±10 % and Frequency ±3 %.

19.3 Voltage

a) Power supply to panels:3 Ph, 4 Wire, 415 V AC ± 10%, 50 Hz ± 3%.

b) Control Voltage inside the Electrical Panel:

- 1 Ph, 2 Wire, 110 V AC for all contactors, relay, indication lamps, etc.
- 1 Ph, 3 Wire, 230 V AC for all lights, power sockets, etc.

c) Control Voltage in the selector switch, indication lamps in control panel, etc:8.9 V, Intrinsic safe module supply. Make: M/s P&F or equivalent after departmental approval.

19.4 Measurement of critical parameters

All the critical parameters as listed below to be taken care for the system performance:

1. Incoming voltage to the system.
   a. 415 Voltage level
2. Current drawn by the overall system.

19.5 Junction Boxes

1. Flame Proof Junction Boxes (Applicable only for the voltage system 24 V DC and above)
   a. FLP junction boxes need to be planned for inter facing of all the equipment which are powered not through intrinsic safe supply (i.e., > 8.9 V).
   b. All the equipment and system connected to this JB shall be terminated using double compression flame proof glands only.
   c. Preferred Make: M/s BALIGA or M/s FCEG or equivalent after departmental approval
2. Non-Flame Proof Junction Boxes (Applicable only for the voltage system of 8.9 V)
   a. Non-FLP junction boxes need to be planned for inter facing of all the equipment which are powered through intrinsic safe supply (i.e., push button control, selector switches, indication lamps, etc).
   b. Preferred Make: Rittal, P&F or President or equivalent after departmental approval
3. The above junction boxes shall be mounted separately on bogie structure near to power pack for easy maintenance of the hydraulic units of power pack.

19.6 Power Socket

1. Incoming to the Bogie system to be tapped from nearby power source by means of suitable rated FLP Swich cum socket with plug top and necessary isolating switch (Both source and bogie side to be considered).
2. Single phase, 230 Volts AC FLP switch cum socket with plug top with necessary isolating switch / MCB inside the panel. Qty: 6 Nos as per the attached schematic drawing.
3. All the locations are as approved by the department.

19.7 FLP Light Fittings

1. 150 Watts FLP LED light fitting with adjustable stand to be provided in the outside of bogie system. Qty: 10 Nos as per the attached schematic drawing.
2. 75 Watts FLP LED light fitting with adjustable stand to be provided in the inside

of bogie system. Qty: 4 Nos as per the attached schematic drawing.

3. 8nos of 50 Watts surface mounted FLP LED light fittings to be provided as per the attached schematic drawing.
4. Final locations of the fittings are to be wetted by the department based on the site conditions.
5. Selector switch-based control shall be planned all the lights in a common location with suitable identification.
6. Intrinsic safe circuit to be used for the control.

19.8 Power Cables

1. All the power cables shall be of 5 core only.
2. Minimum size shall be of 4 sq.mm.
3. The cable running between panel to field equipment are of 1.1 kV Grade, XLPE insulated, copper conductor, G.I. armoured cables only.
4. From power supply source at SLC Complex to Bogie Panel Incomer. Distance: ≈35 mtrs.
   a. It shall be of flexible armoured cables (Equivalent to Ref iGUS or LAPP).
   b. This cable shall be wounded on a cylindrical drum by manually with an identified slot/groove to avoid any damage or entanglement during wounding.
   c. Connecting / mating plug locking arrangement to be made on the wounding system itself.
   d. Incomer cables rating to be considered with all the loads are in operation.
5. Power cables towards the motors are to be selected as follows:
   a. Voltage Drop: 3% Maximum only accepted.
   b. Incomer cables rating to be considered with all the loads are in operation.
6. All the cables to be routed through suitable size cable tray only. Cable tray to be covered with cable tray covers. This tray shall be supplied with suitable bends, tees, etc. in a standard as per the requirement. Fabricating the bends and tees in site not acceptable.
7. The power cable used for extending power supply to the incomer of this wheel bogie system shall have suitable plug and socket mechanism.
8. Main power will be made available by SLC at one point for the entire power and control requirement. Distribution of power from this point to a power panel and from there to the control panel is in the scope of the supplier.

9. Make: iGUS or LAPP or equivalent after departmental approval

19.9 Control Cables

1. All the control cables shall be minimum of 12 core which are running between intrinsic safe junction box to various panels.
2. For the End equipment 4 core to be considered (direction control valve, level switches, etc).
3. The cable running between panel to field equipment are of 1.1 kV Grade, XLPE insulated, copper conductor, G.I. armoured cables only.
4. Out of used cores, 30% of core shall be kept as spare with respect to each size of the cables from panel to junction boxes.
5. Make: iGUS or LAPP or equivalent after departmental approval

19.10 Cable Identification

1. Cable tags indicating the source and destination to be provided for all the cables.
2. The ferrules shall be of ring type and of non-deteriorating material.

19.11 Indication Lamps

1. It shall be of cluster LED provided with translucent lamp covers.
2. Cluster LED module shall be suitable for direct operation on 230 V / 110 V, 50 Hz AC or 24 V DC.
3. Panel shall have the 3-phase indication lamps in the metering cubicle controlled by 3-pole MCB.

19.12 Selector Switch

Following operations to be performed.

1. Selection of light ON/OFF as per the requirement (Zone wise)
2. All the above selector switch shall be driven by Intrinsic Safe relay.

19.13 Panel

1. Design Construction (FLP Panel)
   a. Enclosure – Outdoor, Wall/Surface mounting, Front operated.
   b. Frame, mounting plates, Doors & Covers – 2.0 mm Thickness CRCA.
   c. Degree of protection – IP 54.
   d. Shrouding – As per standard (to be provided inside the panel, in front of power components and power terminals).
   e. Cable entry (power and control) – bottom.
   f. The panels need to be provided with panel lamps (LED) along with door limit switches.
2. Design Construction (Non-FLP Panel)
   a. Enclosure – Indoor, Wall/Surface mounting, Front operated.
   b. Frame, mounting plates, Doors & Covers – 2.0 mm Thickness CRCA.
   c. Glass door – shall be provided in the overall control panel (where control unit, communicating systems, IS barriers, aux. contactors, etc is arranged)
   d. Degree of protection – IP 54.
   e. Shrouding – As per standard (to be provided inside the panel, in front of power components and power terminals).
   f. Cable entry (power and control) – bottom.
   g. The panels to be provided with inbuilt ventilation system.
   h. The panels need to be provided with panel lamps (LED) along with door limit switches.
3. Name Plate (Panel and components)
   a. Material – Transparent acrylic.
   b. Colour of letter – white letter in black background.
4. Multifunction meter
   a. Panel shall be provided with Multifunction meter.
   b. Along with Add-on DI / DO modules – 1 No.
   c. Communication: PROFINET modules.
   d. Make: M/s SIEMENS; Model: PAC 4200 or equivalent after departmental approval.
5. Terminal blocks
   a. Terminal blocks shall be of 750 Volts grade of the stud type and shrouded.
   b. Insulating barriers shall be provided between adjacent terminals.
   c. All the terminal blocks are grouped with respect to the following:
      i. 24 V Power distribution (separately for positive and negative).

ii. 110 V Power distribution (separately for phase and neutral).
iii. 230 V Power distribution (separately for phase and neutral).
iv. 415 V Power distribution if any.
v. Motor and brake power distribution.

d. Short linked Terminal blocks are to be used for terminal multiplication. More than one wires need to be avoided in one terminal block.
e. All future interlocks to be provided with permanent shorting link.
f. Power & Control circuit (used for field cables) – Ring type end termination of suitable size.
g. All the terminals need to be provided with group markers.
h. 25% Spare Terminals Shall be provided for both Power and Control in each Panel.
i. Make: Connectwell / Wago / Elmex or equivalent after departmental approval.

6. Rubber mats
   a. Rubber mats to be supplied and provided in-front of all the panels as per the designed length of panels including Transformer and DBR panels.
   b. Class 'A', 3.3 kV ac (rms), 2.0mm ± 10% thickness as per IS 15652/2006
   c. Width: 1 mtrs. (maximum)

19.14 Electrical Specifications

1. MCCB
   a. Suitable rated to be provided as an Incomer.
   b. Suitable rated outgoing to be considered for the Hydraulic jack panel and
   c. Panel kept for the controlling of lights and power for the bogie system.
   d. All the above with adjustable overload, adjustable short circuit protection, adjustable ground fault and Instantaneous protection.
2. MCB
   a. Voltage input to the Multifunction meter shall be routed through 4-pole MCB.
   b. Individual components control shall be planned by a dedicated MCB control.
3. Earthing
   a. From earth strip from nearest source at SLC Complex to Bogie system. Distance: ≈35 mtrs.
   b. Earth strip (min. 25 x 6 mm) need to be considered.
   c. All the equipment including the mechanical structure needs to be grounded

effectively with double earthing.

d. Suitable bridge clamp needs to be positioned on the bogie for tapping of earth points.

e. Panel shall be provided with earthing provision at both the ends. Same shall be connected with plant earth by the contractor.

f. To link panel to rail and link all the electrical elements on the Bogie system,

i. It shall be of flexible braided copper strip.

ii. This strip shall be wounded on a cylindrical drum by manually with an identified slot/groove with crocodile clip for extending earthing.

4. Cable Tray

a. Perforated G.I. cable trays need to be planned for routing the cables from all the panels to end equipment.

b. Necessary supports (like angles, etc) for running the cable tray on the bogie structure, etc need to be supplied.

c. Entire length of the cable trays needs to be covered with G.I. sheet cover with bolts and nuts and all bolts and nuts shall be of G.I coated.

d. No cables are routed without cable trays and cover anywhere from panel room to top of the crane.

e. The cable trays are also to be earthed with respect to the common ground.

f. Aluminium strip shall not be used for earthing the cable tray. Only G.I strip alone shall be used.

5. Inside the Panel (Common for FLP and Non-FLP):

a. Power circuit – Minimum size: 4 Sq.mm.

b. Control circuit – Minimum size: 2.5 Sq.mm.

c. Colour coding should be followed as:

i. 110 V AC Phase – Grey without sleeve.

ii. 240 V AC Phase – Grey with RED sleeve.

iii. 110 V &240 V AC Neutral– Grey with BLACK sleeve.

iv. 415 V AC – Black with RED, YELLOW, BLUE and / BLACK.

v. 24 V DC Positive– Red.

vi. 24 V DC Negative– Blue.

vii. 8.9 V DC – Orange.

viii. Earth cable – Green & Yellow.

6. Contactor

a. Power Contactors

i. Duty: AC-3.
ii. The contactors shall be able to withstand their rated current for one second without welding / fusing of the contacts.
iii. Individual Power Contactors are to be provided for each zone of lighting for controlling.
iv. All the power contactors need to be powered viz. suitable rating along with surge suppressor
v. NO add-on blocks will be allowed for power contactors.

7. Intrinsic Safe Relay
   a. Input Relay:
      i. All the selector switches, etc. to be wired to this relay.
      ii. This relay shall be located in safe area (inside the FLP panel) only. Make: M/s P&F or equivalent after departmental approval.
      iii. All this relay shall be selected to suitable for operating with either 24 V or 110V AC supply.
   b. Output Relay:
      i. These relays shall be used for powering indication lamps in the hazardous location.
      ii. This relay shall be located in safe area (inside the FLP panel) only. Make: M/s P&F or equivalent after departmental approval.
      iii. All this relay shall be selected to suitable for operating with either 24 V or 110V AC supply.

SECTION –B2

PAINTING SPECIFICATION FOR BOGIE SYSTEM

1.0 SURFACE PREPARATION AND PAINTING

1.1 Complete Bogie System shall be painted as per the instructions given below.

a) All the shop-fabricated items shall be grit blasted, primer painted and then transported to site for erection.
b) The site fabrication items also shall be grit blasted and primer painted before erection.
c) After completion of the erection, all the damaged primer painted area shall be rectified.
d) After Primer painting, the total surface shall be painted as per the painting scheme stated in Clause 1.4 of this Specification.
e) Surfaces that may become inaccessible after manufacture / erection, shall be prepared and painted while still accessible during various stages of manufacture / erection as per the same procedure as stated in this specification.

1.2 PREPARATION OF SURFACES

a) All surfaces to be painted shall be clean, dry and free from oil, grease, dirt, dust, corrosion and weld spatters.
b) Any other surface contaminant except tightly bonded residues of mill scale rust is permissible to a limit of not more than 5% of whole surface and a maximum of 10% on any particular square inch area.

1.3 GRIT BLASTING

a) The entire surface of all the fabricated materials is to be Grit blasted as per near white quality of Steel Structures Painting Council (SSPC) standard of SA 2.5 of SIS 055900.
b) The surface profile after blasting shall be between 37-65 microns and should be jagged in nature.
c) Hand cleaning shall be carried out by chipping and scraping followed by wire brushing / abrasive wheels for items for which surface preparation is difficult by Grit blasting after taking approval from purchaser / TPIA. All surfaces shall

be degreased using a suitable solvent to remove oil and grease and shall be dried off before painting.

1.4 PAINTING SCHEME

a) Immediately after Grit blasting, the following Painting Scheme shall be followed for Bogie System:

Sr. No.	Layers	Paint	Dry Film Thickness (DFT) (µm)
1.	Primer	Inorganic Zinc Silicate	65 (minimum)
2.	Intermediate Coat	High Build MIO Epoxy	75 (minimum)
3.	Final Coat	Acrylic Aliphatic Polyurethane	40 (minimum)

b) All paint and primer shall be of standard quality and procured from approved manufacturers as prescribed in the list furnished. The contractor shall provide the purchaser “Elcometer” / Paint thickness measuring gauges free of charge and shall measure the thickness of paint in the presence of the representative of the PURCHASER at random locations selected by him.

c) Machine finished surfaces shall be protected against corrosion by a rust inhibiting coating that can be easily removed prior to erection or which has characteristics that make removal unnecessary prior to erection.

d) Field painting shall only be done after the structure is erected, levelled, plumbed, aligned and welded/connected in its final position, tested and commissioned. However, touch up painting, making good to any damaged shop painting and completing any unfinished portion of the shop coat shall be carried out by the contractor at free of cost. The materials and specification for such painting in the field shall be in accordance with the requirements of the specification for shop painting.

e) Painting shall not be done in frosty or foggy weather or when humidity is such as to cause condensation on the surfaces to be painted. Before painting of

steel, which is delivered unpainted, is commenced, all surfaces to be painted shall be dried and thoroughly cleaned from all loose scale and rust.

f) All field rivets, bolts, welds and abrasions to the shop coat shall be spot painted with the same paint used for the shop coat. Where specified, surfaces which will be in contact after site assembling shall receive a coat of paint (in addition to the shop coat, if any) and shall be brought together while the paint is still wet.

g) Bolts and fabricated steel members, which are galvanized or otherwise treated, shall not be painted.

h) Paints shall be stored under cover in airtight containers. Paints supplied in sealed containers shall be used up as soon as possible once the container is opened.

i) While painting the new structures, the already finished floors and structures shall not be spoilt. If there is any spillage of paint on the floors or members on the finished structures, the contractor has to clear and provide the painting to the spoiled areas.

j) Paints supply shall be checked for shelf life to meet the requirements before application. Proper action shall be taken well in advance prior to actual usage.

2.0 PAINT SPECIFICATIONS

2.1 The Technical Specification for the Paints to be used shall be as per MANUFACTURER’s specification duly approved by the PURCHASER.

Colour code will be finalised by DEPARTMENT after award of CONTRACT.

SECTION –B3

QUALITY ASSURANCE PLAN

SL. NO.	COMPONENT/ OPERATION	CHARACTERISTICS TO BE CHECKED	METHOD OF CHECKING	CATEGORY	EXTENT OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE NORMS	FORMAT OF RECORDS	INSPECTION AGENCY			REMARKS
									VR	TP	IS	
A.	MATERIAL (RAW MATERIALS & BOUGHTOUTS)											
1	Rolled plates & sections Forged steel & Castings High Yield Steel	a. Appearance	Visual	Major	100%	IS:2062	Freedom from defects like pitting, cracks, etc.	--	H	H	R	
		b. Properties	Chemical analysis & physical test	Major	100%	IS:2062	Drawing, specification	Mill test certificates/ Lab reports	H	R	R	
		c. Internal flaws	UT	Critical	100% for plates ≥20mm thick, 100% for Castings & Forgings	ASTM A435	Specification	NDT reports	H	H	R	
2	Fasteners (high tensile bolts & nuts etc.)	a. Quality	Visual	Major	Sample check as per relevant specification	IS:1367	a. No cracks b. Proper matching with nuts	IR	H	W	R	
		b. Chemical composition & physical properties	Chemical analysis, mechanical test	Major	Sample check as per relevant specification	IS:1367	IS:1367 Part III	Manufacturer's test certificates	H	R	R	
		c. Dimensional	Measurements	Major	Sample check as per relevant specification	IS:1367	IS:1367 Part III & XIII		H	W	R	
3	Wheel, Rail Clamp	Dimensional conformance	Measurements	Major	100%	As per Manufacturer's Specification	As per Manufacturer's Specification	IR	H	W	R	
		Performance Tests	Verification	Major	100%	As per Manufacturer's Specification	As per Manufacturer's Specification	IR	H	W	W	

Legend:
VR – Vendor
IS – ISRO
TP – Third Party Inspection Agency
H – Carrying out responsibility
R – Review of records & results
W – Test/inspection to be witnessed

Signature For VENDOR

Signature For THIRD PARTY

Signature For ISRO

Date :

Place:

SL. NO.	COMPONENT/ OPERATION	CHARACTERISTICS TO BE CHECKED	METHOD OF CHECKING	CATEGORY	EXTENT OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE NORMS	FORMAT OF RECORDS	INSPECTION AGENCY			REMARKS
									VR	TP	IS	
B. WELDING PROCEDURE, WELDER'S QUALIFICATION, ETC.												
1	Welding	WPS, Welder's & Welding operator's qualification	Test piece, Visual, Physical & NDT (RT)	Critical	100%	ASME Sec IX	ASME Sec IX	WPS, PQR & WPQ	H	H	R	
C. FABRICATION (Spacer Block, Balancers, Yokes, Interconnecting structure, Bearing retainers, etc.)												
1	Setting out / Layout / Marking / CNC programming	Layout	Measurement	Major	100%	Relevant drawings	Full scale layout to be checked before cutting	Shop register	H	W	R	
2	Fitup before welding.	Quality	Visual alignment & check of major dimensions	Major	100%	Drawings	a. proper edge preparation b. proper tack welds c. minimum gap for butt joints as per WPS d. DIN-8570	IR	H	H	R	Members requiring site welding shall be match marked at joining ends for site erection
3	Welding (fillet joints)	Profile, fillet size, overall physical appearance	Visual/ gauge, DP/ MPT after final welding	Major	100%	ASME SecVIII, Vol-1	Drawings	IR	H	W	R	10% DP test at random shall be done
4	Full penetration welding	a. Root inspection after back gouging	Visual & LPI	Major	100%	IS:3658	No cracks allowed	IR	H	W	R	
		b. Internal defects	UT / RT	Critical	Wherever asked in the drawing	ASME Sec-VIII, Vol-1	ASME Sec-VIII, Vol-1	Test report	H	W	R	

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SL. NO.	COMPONENT/ OPERATION	CHARACTERISTICS TO BE CHECKED	METHOD OF CHECKING	CATEGORY	EXTENT OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE NORMS	FORMAT OF RECORDS	INSPECTION AGENCY			REMARKS
									VR	TP	IS	
		c. Welding quality, surface defects	LPI / MPI	Critical	Wherever asked in the drawing	ASME Sec-VIII, Vol-1	ASME Sec-VIII, Vol-1	Test report	H	H	R	
5	Stress relieving (after complete welding)	T-T curves	T-T curve verification	Major	100%	ASME Sec-VIII, Vol-I	Drawings	T-T graph	H	R	R	
6	Dimensional inspection after welding & stress relieving	Dimensional	Measurement of major dimensions & full size shop layout checking	Major	100%	Drawing / DIN 8570	Drawings	IR	H	H	W	
D. GRIT BLASTING & PAINTING												
1	Grit blasting & painting	Paint thickness	Visual & measurement by paint thickness gauge	Major	At random for paint thickness	Drawing & specification	Drawings & specification	IR	H	W	R	
E. MACHINING (Spacer Block, Balancers, Yokes, Axles, Interconnecting structure, Bearing retainers, etc.)												
1	Machining	Overall dimensions	Measurement & visual	Major	100%	Drawing	Drawing	IR	H	H	R	
2	Drilling, etc.	Drilling & tapping	Measurement of hole size & center distances	Critical	100%	Drawing & DIN 8570	Drawing	IR	H	H	R	

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									VR	TP	IS	
F.	SUB – ASSEMBLIES of Bogie System											
1.	Balancer with Yoke Assembly	Level, Alignment & Free Movement	Measurement, visual & Manually movement	Critical	100 %	Drawing	Drawing	IR	H	W	W	
2.	Bogie Structure on Balancer & Yoke Assembly	Level, Alignment	Measurement& visual	Critical	100 %	Drawing	Drawing	IR	H	W	W	
3.	Wheel & Axle Sub-Assembly	Level, Alignment & Free Movement	Measurement, visual & Manually movement	Critical	100 %	Drawing	Drawing	IR	H	W	W	
4.	Bogie Assembly with Wheels	Level, Alignment & Free Movement	Measurement, visual & Manually movement	Critical	100 %	Drawing	Drawing	IR	H	W	W	
G.	Control Assembly of Balancers, Yokes, Interconnecting Structure, Axles, Wheels, etc. AT SHOP											
1.	Control assembly works	Dimensions, Levels, Alignment, Erection of clits with fasteners	Visual & Measurement	Critical	100 %	Drawings	Drawings	IR	H	H	W	Before dismantling reference line & match marking to be punched. Welding of erection clits to be ensured

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SL. NO	COMPONENT/ OPERATION	CHARACTERISTICS TO BE CHECKED	METHOD OF CHECKING	CATEGORY	EXTENT OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE NORMS	FORMAT OF RECORDS	INSPECTION AGENCY			REMARKS
									VR	TP	IS	
H.	ERECTION AT SITE											
1.	Fabricated material inspection	Visual, dimensional, review of TC & IR	Visual & measurement	Major	100%	TS & approved drawings	TS & approved drawings	IR	H	R	R	
2.	Welding & welder qualification	WPS, Welder's & Welding operator's qualification	Test piece, Visual, Physical & NDT (RT)	Critical	100%	ASME Sec IX	ASME Sec IX	WPS, PQR & WPQ	H	W	R	
3.	Welding	Preheat / interpass / sequence of welding	Visual	Major	100%	Drawing & TS	Drawing & TS	IR	H	H	W	
4.	Stress relieving	T-T curves	T-T curves, charts	Critical	100%	Drawing & TS	Drawings & TS	IR	H	H	W	
5.	Complete welding	Visual, DPT, UT	Visual & UT	Major	100%	TS & drawings	TS & drawings	IR	H	H	R	
6.	Dimensional check of whole assembly	Position, level, alignment and other dimensions, clearances	Measurement & Visual	Major	100%	Drawings	Drawings	IR	H	H	W	
7.	Bogie Movement along the Track	Clearance	Visual & Measurement	Major	100%	TS & Drawings	TS & Drawings	IR	H	H	H	
8.	Assembly of MLS with Bogie	Position, level, alignment and other dimensions, clearances & Interfaces	Measurement & Visual	Major	100%	TS & Drawings	TS & Drawings	IR	H	H	H	
9.	MLS Movement with Bogie System on Straight Track by using hauler	Clearances	Visual & measurement	Major	100%	TS & drawings	TS & drawings	IR	H	H	H	
10.	MLS Movement with Bogie System on Curved Track by using Hauler	Interface	Visual & Measurement	Major	100%	TS & drawings	TS & drawings	IR	H	H	H	

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For VENDOR For THIRD PARTY For ISRO Place:

SECTION –B4

WELDING SPECIFICATION FOR SHOP AND SITE FABRICATED EQUIPMENT

1. SCOPE

This specification shall apply to shop and site fabrication of all welded joints in carbon steel, low alloy steel and stainless-steel equipment like pressure vessels, tanks, columns and heat exchangers etc. The specification shall apply to all the joints indicated below:

(a) Butt joints produced by double sided welding which produce the same quality of deposited weld metal on both inside and outside weld surfaces

(b) Butt joints produced by single sided welding having backing strip which remains in place and full penetration butt weld without backing strip

(c) Corner or those joints connecting two (2) members approximately at right angles to each other in the form of L or T

(d) Partial penetration welds of the groove type which are used for connections not subjected to external loading

(e) Fillet welded joints of approximately triangular cross-section joining two (2) surfaces at approximately right angles to each other and having a throat dimension at least 70% of the thinner of the parts being joined but not less than 6 mm

(f) Welds attaching nozzles and other connections

(g) Welds which are used to join non-pressure parts like supports, lugs, brackets, stiffeners and other attachments to the vessel wall.

(h) Any other similar joint which is not specified above but may be encountered during fabrication.

2. CODES AND STANDARDS

2.1 The welding equipment, welding consumables, preheating, Post weld Heat Treatment (PWHT), other auxiliary functions and welding personnel shall comply with all currently applicable statutes, regulations and safety codes in the locality where the equipment are to be fabricated and installed. Nothing in this specification shall be construed to relieve the

VENDOR/CONTRACTOR of this responsibility. Specifically, the latest editions of the codes and standards listed below shall apply:

(a) ASME Boiler and Pressure Vessel Code (BPV Code), Section II Part C - Material Specifications for Welding Rods, Electrodes, and Filler Metals

(b) ASME BPV Code, Section V - Non-destructive Examination (NDE)

(c) ASME BPV Code, Section VIII Division 1- Rules for Construction of Pressure Vessels.

(d) ASME BPV Code, Section IX - Welding and Brazing Qualifications

(e) American Society of Non-destructive Testing (ASNT) SNT-TC-IA-Recommended Practice

(f) Indian Boiler Regulations (IBR)

(g) Any other codes and standards specified in Section C or data sheet A of Section D of enquiry specification

2.2 The codes and standards listed in para 2.1 forms an integral part of this specification. In the event of conflict between this specification and the codes and standards, the more stringent shall govern.

2.3 If no specific requirements are given in this specification, the requirements of the applicable code shall govern.

3. WELDING PROCESSES

The following welding processes shall be used:

3.1 GAS TUNGSTEN ARC WELDING (GTAW)

3.1.1 The root pass of single-sided groove welds without backing

3.1.2 Full penetration nozzle connection where other side is inaccessible

3.1.3 Any butt and fillet weld on equipment with thickness 5 mm or less

3.1.4 For all passes of butt and fillet welding of nozzles on equipment and integral piping of size 50 mm NB or smaller

3.2 SUBMERGED ARC WELDING (SAW)

Maximum weld deposit per pass shall be 12.7 mm for carbon steel (P-1) and 9.5 mm for other materials.

3.3 Gas Metal Arc Welding (GMAW) and Flux Cored Arc Welding (FCAW) processes

3.4 Other processes such as plasma-arc and electro-slag welding may be used only with the approval of the PURCHASER and depending upon the process and application proposed. These processes may require testing in addition to that specified by the governing procedure qualification code.

3.5 Table-1 gives recommendations for welding processes to be used for carbon, low alloy and austenitic stainless steels.

4. WELDING CONSUMABLES

4.1 The VENDOR/CONTRACTOR shall provide, at no additional cost, all the welding consumables such as electrodes, filler wires, flux, oxygen, acetylene and argon etc., in order to complete the welding in all respects. The consumables shall be from reputed and approved manufacturers. All the consumables shall be approved by the PURCHASER.

4.2 The electrodes and filler wires shall be of the class specified in Table 1 Welding Specification Chart.

4.3 Electrode qualification test records shall be submitted for the PURCHASER's approval. The VENDOR/CONTRACTOR shall also submit batch test certificates from the electrode manufacturer for physical and chemical tests.

4.4 Electrodes shall be in sealed containers and adequate care shall be taken for storage, strictly in accordance with the manufacturer's recommendations.

4.5 Electrodes, which have been removed from the original containers, shall be kept in baking ovens as per the manufacturer's recommendations and, once these are taken out, shall be consumed within the time limits stipulated by the manufacturer. Care shall be taken in handling the electrodes to prevent any damage to the flux covering. Portable ovens shall be used for carrying the electrodes from the main oven to the field. Electrodes of different specifications shall be stored in different compartments of a baking oven to avoid mix up.

4.6 The electrodes, filler wires and flux used shall be free from contamination such as rust, oil, grease and such foreign matter.

4.7 Low hydrogen electrodes shall be used for weld joints in carbon steel if the wall thickness exceeds 19 mm and low alloy steel of all thicknesses except that non-low hydrogen electrodes shall be permitted for the root pass of carbon steel only.

4.8 If ultimate tensile strength of base material permits, E 6010 electrodes may be used, for root pass of butt welds and for fillet welds, in carbon steel.

5. WELDING QUALIFICATIONS

5.1 Qualification of the welding procedures to be used and the performance of welders and welding operators shall conform to the requirements of the

BPV Codes and Section IX. For equipment under the purview of IBR, these shall also meet the requirements of IBR.

5.2 No production welds shall be undertaken until the qualification requirements are completed to the satisfaction of the PURCHASER.

5.3 When impact testing is required by the code or by the specification, these requirements shall be met in qualifying welding procedures.

5.4 The VENDOR/CONTRACTOR shall be responsible for qualifying any welding procedure, welders and welding operators intended to be deployed. The VENDOR/CONTRACTOR shall submit the Welding Procedure Specification (WPS) for acceptance by the PURCHASER. After approval by the PURCHASER, the procedure qualification test shall be carried out by the VENDOR/CONTRACTOR, at his own expense, duly witnessed by the PURCHASER. A complete set of test results, in specified format, shall be submitted to the PURCHASER for approval immediately after successful completion of procedure qualification test. All tests as required by the BPV code Section IX or IBR shall be carried out. The WPS shall require re-qualification, if any of the essential variables or supplementary variables is altered.

5.5 Welders and welding operators shall be qualified in accordance with BPV Code and Section IX or IBR, as applicable. The qualification shall be carried out in the presence of the PURCHASER. Only those welders and welding operators who are qualified by the PURCHASER shall be deployed on the job. For equipment under the purview of IBR, approval of the local IBR inspector shall be obtained by the VENDOR/CONTRACTOR.

5.6 Welders and welding operators shall always keep their identification cards with them and shall produce them on demand. The VENDOR/CONTRACTOR shall issue the identity cards after the same are

duly certified by the PURCHASER. Welder or welding operator, who is not in possession of the identity card, shall not be allowed to work.

5.7 The VENDOR/CONTRACTOR shall use forms as per BPV code, section IX, form QW-482, form QW-483 and form QW-484. Other forms are also acceptable subject to approval by the PURCHASER.

5.8 Unless agreed otherwise, the VENDOR/CONTRACTOR shall advise the PURCHASER, in writing, at least three (3) weeks before any welder or welding operator is deployed on the work, the names and qualifications of the proposed welders, welding operators and welding supervisors. It shall be the VENDOR/CONTRACTOR's responsibility to ensure that all welders and welding operators employed by him or his SUB-VENDORS/SUB-CONTRACTORS, on any part of the work either in the VENDOR/CONTRACTOR's or his SUBVENDOR/SUB-CONTRACTOR's works or at site are fully qualified as required by the code. Each welder and welding operator shall qualify for all types of welds, positions and materials or material combinations he may be called upon to weld.

5.9 Should the PURCHASER require to qualify or requalify any welder or welding operator, the VENDOR/ CONTRACTOR shall make available, at no extra cost to the PURCHASER the men, equipment and materials for the tests. The cost of testing the welds shall be borne by the VENDOR/CONTRACTOR.

5.10 Welding supervisors shall have qualifications such as engineering degree or engineering diploma in welding technology with adequate knowledge of welding consumables, welding machines, NDE and a minimum of five (5) years of experience in supervising welding of joints.

5.11 All welding, including the tacking up of all welds shall be carried out by qualified welders and welding operators as per approved WPS. Any weld

made by other than a qualified welder or welding operator or not carried out as per approved WPS shall be cut out and re-welded.

5.12 For purposes of identification and to enable tracing full history of each joint, each welder and welding operator employed on the work shall be given a designation. The welder and welding operator's designation and the date on which the join was made, shall be stamped near the relevant joint and on the relevant drawings also. Copies of the drawings so marked shall be furnished to the PURCHASER for record purposes. For austenitic stainless steels, welder and welding operator's designation shall be applied with water-proof paint or by etching or stencilling machine that is not detrimental to the metal. Alternatively, record cards may be used.

5.13 For each welder and welding operator, a record card shall be maintained showing the procedures for which he is qualified. These cards shall note the production welds, the date of the welding done, the type of defects produced and their frequency. The record shall be reviewed once in a week by the PURCHASER and those welders and welding operators whose work required a disproportionate amount of repair shall be disqualified from welding. Requalification of welders and welding operators disqualified more than three (3) times shall be entirely at the discretion of the PURCHASER. As far as possible, the qualification shall be carried out at the location (site or shop) where the actual fabrication and welding work is to be carried out.

6. PREPARATION FOR WELDING

6.1 Surfaces to be welded shall be smooth, uniform and free from fins, tears and other defects, which would adversely affect the quality of the weld. All welding faces and adjoining surfaces, for a distance of at least 50 mm from the edge of the welding groove or 12 mm from the toe of the fillet in the case of socket welded or fillet welded joints, shall be thoroughly cleaned of rust, scale, paint, oil or grease, both inside and outside.

6.2 Joints for welding shall be as per the project specifications and approved fabrication drawings.

6.3 Butt joints shall be prepared as per ASME BPV Code Section VIII Division 1, unless specified otherwise. For equipment under the purview of IBR, these shall be as per IBR. Any other end preparation which meets the WPS is acceptable.

6.4 Internal misalignment shall be reduced by trimming but such trimming shall not reduce the finished wall thickness below the required minimum wall thickness. Trimming shall not be abrupt. It shall be tapered with a minimum slope of 1:3. Root opening of the joint shall be within the tolerance limits of the WPS.

6.5 Welds shall be as per ASME BPV Code Section VIII Division 1 or in accordance with IBR for equipment under the purview of IBR.

6.6 Reinforcing pads and saddles shall have a good fit with the parts to which they are attached. A tell-tale hole shall be provided on the side of any pad or saddle to reveal leakage in the weld and to allow venting during welding and heat treatment. Pad or saddle shall be added, after the branch weld has undergone satisfactory visual and NDE.

6.7 The ends shall be prepared by machining, grinding, flame cutting or plasma cutting. Where flame cutting is used, the effect on the mechanical and metallurgical properties of the base metal shall be taken into consideration. Flame cutting of alloy steel is not advisable. If alloy steel is cut using flame, the heat affected zone shall be removed completely by grinding and/or machining Magnetic Particle (MT) or Liquid Penetrant (PT) testing shall be carried out to ensure soundness of edges. However, flame cutting of carbon steel is permitted. Wherever practicable, flame cutting shall be carried out by machine. Machine

flame-cut edges shall be substantially as smooth and regular as those produced by edge planning and shall be cleaned free of slag. Manual flame cutting shall be permitted only where machine flame cutting is not practicable and with the approval of the PURCHASER, and such surfaces shall be ground or dressed to a smooth finish as required by the specification and to the satisfaction of the PURCHASER. Slag, scale or oxides shall be removed by grinding to bright metal at least two (2) mm beyond the burnt area.

6.8 Thermal cutting of carbon steel shall be performed under the same conditions of preheating and PWHT as for the welding of each class of material. However, PWHT is not required when:

(a) The heat affected zone produced by thermal cutting is removed by mechanical means immediately after cutting. However, in any case, all remaining slag, scale or oxides shall be removed by grinding to bright metal at least two (2) mm beyond the burnt area, or

(b) Thermal cutting is part of fabrication, manufacturing or erection sequence leading to a weld end preparation where welding immediately follows.

6.9 On austenitic stainless steels, plasma cutting, machining or grinding methods shall be used for edge preparation. Flame cutting is not permissible. Cut surfaces shall be machined or ground smooth after plasma cutting. Stainless steel materials shall be ground with Al_2O_3 grinding wheels and cleaned with stainless steel wire brushes.

6.10 Before fitting up the weld joint, the profile and dimensions of the weld end preparation shall be checked by the PURCHASER. If the specified tolerances are exceeded, this shall be corrected (with prior approval) by grinding, machining or any other method acceptable to the PURCHASER.

6.11 Fit-ups shall be examined by the PURCHASER prior to welding the root pass.

7. TECHNIQUE AND WORKMANSHIP

7.1 Stainless steel welding shall be carried out at a location away from carbon steel welding.

7.2 Components to be welded shall be aligned and spaced as per the requirements of the code and WPS.

7.3 Alignment and spacing shall be achieved using suitable wires to maintain the gap. These shall be removed after tack welding. The ends to be welded shall be held using suitable clamps, yokes or other devices which will not damage the surfaces in any manner. It shall be ensured that welding operations do not result in distortions.

7.4 Earthing shall be provided on the job using earthing clamps of similar material as the job. Earthing shall not be given through welding rotators.

7.5 Tack welds at the root joint, for maintaining joint alignment, shall be made only by qualified welders or welding operators and with filler metal equivalent to that used in the root pass. Tack welds shall be fused with the root pass weld, except that those which have cracked shall be removed. Peening is prohibited on the root and final passes of a weld. The required preheat shall be maintained prior to tack welding. Means shall be made available to measure preheat temperature.

7.6 No welding shall be carried out if there is any impingement in the weld area of rain, snow, excessive wind or if the weld area is wet.

7.7 Irrespective of the class of steel, root runs shall be made without interruption other than for changing the electrodes or to allow the welder or welding operator to reposition him. Root runs made in the shop may afterwards be allowed to cool by taking suitable precautions to ensure slow cooling e.g. by wrapping in a dry asbestos blanket. Welds made at site shall not be allowed to cool until the thickness of weld metal deposited exceeds one third of the final weld thickness or 10 mm, whichever is greater.

7.8 When welding alloy steels, it is strongly recommended that interruption of welding be avoided. Where such interruption is unavoidable, either the preheat shall be maintained during the interruption or the joint shall be post heated or wrapped in dry asbestos blankets to ensure slow cooling. Before recommencing welding, preheat shall be applied again.

7.9 Welded-on bridge pieces and temporary attachments shall preferably be avoided. Where approved by the PURCHASER, these may be used. Material of these shall be compatible with material with which they are temporarily welded. All such pieces shall be removed after welding of joints and the weld area ground flush. These areas shall be subjected to MT and PT examination. These pieces shall be welded by qualified welders and welding operators and with electrodes compatible with the parent material. The preheating requirements of material shall be applied and maintained during the welding of attachments. These temporary attachments shall be removed by grinding, chipping, sawing or by arc or flame gouging. When arc or flame gouging is used, at least three (3) mm of metal shall be left around the surface which shall be removed by grinding. This metal shall not be removed by hammering or by use of force.

7.10 The arc shall be struck only on those parts of parent metal where weld metal is to be deposited. When inadvertent arc-strikes are made on the base metal surfaces outside the joint groove, the arc-strikes shall be removed by grinding and shall be examined by MT and PT procedures.

7.11 Oxides shall not be permitted to form during welding or heat treatment or both, on the internal surfaces which will not be subsequently cleaned. Inert gas purging is an acceptable method to prevent such oxidation. All joints in materials which contain more than 1¼ % chromium shall be purged to assure that less than 1% of oxygen is present on the joint underside before initiation of the welding. The purging operation shall be maintained for a minimum of two (2) passes.

7.12 Argon gas used in GTAW process for shielding and purging shall be at least 99.95% pure. Purging shall be carried out at a flow rate depending on diameter until at least five (5) times the volume between dams is displaced. In no case shall the initial purging period be less than 10 minutes. After initial purging, the flow of the backing gas shall be reduced to a point where only a slight positive pressure prevails. Any dams used in purging shall be fully identified and removed after welding and accounted for in order to avoid leaving them in the system. The rate of flow for shielding purposes shall be established in the procedure qualification.

7.13 Thorough check shall be exercised to maintain the required inter-pass temperature.

7.14 All equipment necessary to carry out the welding, for supporting of the work, for preheating and PWHT including thermal insulation for retaining the heat and for the protection of the welder and welding operator shall be provided by the VENDOR/CONTRACTOR at no extra cost. All necessary precautions shall be taken during cutting and welding operations. It shall be ensured that proper ventilation is available in the welding area and adequate protective gear such as goggles, masks, gloves, protection for the ears and body are used at all times. For guidelines refer ASME standard Z49.1, “Safety in Welding and Cutting”.

7.15 After deposition, each layer of weld metal shall be cleaned with a wire brush to remove all slag, scale and defects, to prepare for the proper deposition of the next layer. The material of wire brush shall be compatible with parent material. Stainless steel materials shall be cleaned with grinding wheels or stainless-steel brushes which have not been used on other materials. Either aluminium oxide or silicon carbide grinding wheels shall be used. Special care shall be taken to secure complete and thorough penetration of the fusion zone into the bottom of the weld. It is recommended that the root run be checked by MT or PT procedures for critical equipment.

7.16 If specified, upon completion of welding, the joints shall be wrapped in dry asbestos blankets to ensure slow cooling, unless PWHT is applied immediately.

7.17 No welding or welded parts shall be painted, plated, galvanised or heat treated until inspected and approved by the PURCHASER. Welds shall be prepared and ground in such a way that the weld surfaces merge smoothly into the base metal surface, particularly for welds which are to undergo NDE.

7.18 Except where necessary to grind flush for NDE, reinforcement for butt welds may be provided. The height of such reinforcement shall meet the requirements of the code. The reinforcement shall be crowned at the centre and tapered on each side of the joined members. The exposed surface of the weld shall be ground where required to present a workmanlike appearance and shall be free from depressions below the surface of the joined members. The exposed surface of the butt welds shall be free from undercuts, overlaps or abrupt ridges or valleys and shall merge smoothly into the surface at the weld toe.

7.19 Repair of weld metal defects shall meet the requirements of the code.

7.20 Any weld repair shall be subject to the approval of the PURCHASER.

7.21 In the event of several unsuccessful repair attempts or if the PURCHASER feels that a satisfactory repair is not feasible, the joint shall be completely remade.

7.22 It is preferable to use welding rectifier or DC generator for welding of austenitic steels and while using low hydrogen electrodes.

7.23 IDENTIFICATION OF WELDS

Wherever code symbol stamps are required on carbon steel and ferritic alloy steel they shall be applied directly on to the member with low stress dotted design metal die stamps or to a small stainless-steel plate especially provided for such marks. These plates shall be lightly tack welded using electrodes, of diameter three (3) mm or less, of the type specified for the material. Before making the required tack weld, the material in the immediate surrounding area shall be preheated, as required, by electric means or propane or natural gas burners. Cooling shall take place under asbestos insulation in a draft-free area. Stress relieving of these welds is not required. Steel stamping directly on the surface of alloy steel with other than low stress die stamps shall not be used.

7.24 SEAL WELDS

7.24.1 Seal welding shall be carried out by qualified welders and welding operators and in accordance with approved drawings.

7.24.2 Threaded joints that are to be seal welded shall be made without the use of thread lubricating compound. Seal weld shall cover all exposed threads.

7.25 WELD ENCROACHMENT AND MINIMUM DISTANCE BETWEEN WELDS

7.25.1 Welded joints, more specifically longitudinal welds, shall be placed not closer than 50 mm to opening or branch welds, reinforcements,

attachment devices or from supports etc. In case of deviation, the PURCHASER may specify additional NDE.

7.25.2 The longitudinal welds of two adjacent components shall be staggered by at least 30°. The minimum distance between welds shall be 50 mm or three (3) times the wall thickness, whichever is greater. Intersection of welds shall be avoided as far as possible. If such welds are present, they shall be subject to suitable NDE at the discretion of the PURCHASER.

8. PREHEATING

8.1 Preheating prior to tack welding, welding and thermal cutting shall be used as a means of crack prevention and improving weld reliability. The general requirements of PWHT also apply to preheating.

8.2 Preheating shall be used as per the recommendations of ASME BPV Code Section VIII Division 1. For equipment under the purview of IBR, the requirements of IBR shall govern. Preheating of austenitic stainless steels is not required, except at low ambient temperatures, in which case a minimum preheat temperature of 10°C is recommended. Table 2 gives the requirements of preheating for commonly used materials.

8.3 The preheating zone shall extend 75 mm or a distance equal to four (4) times the material thickness, whichever is greater, beyond the edge of the weld.

8.4 The preheat temperature shall be measured at least 75 mm away from the weld preparation.

8.5 Where preheating is specified, welding shall continue without interruption. In case interruption cannot be avoided, preheating shall be carried out before recommencement of welding.

8.6 Oxy-acetylene preheating shall not be applied.

8.7 For preheating, fuel gas/air torches, burner systems (high velocity gas or oil burners) or electrical heating may be used either locally or in a furnace. For preheating above 250^{o}C, electric heating (resistance or inductive heating) is recommended.

8.8 Approved temperature - indicating crayons, thermocouples or digital contact or laser pyrometers shall be used to measure preheat and inter-pass temperatures. A calibration report of the pyrometers and thermocouples shall be available.

8.9 When the preheat temperature is 150^{o}C or higher, the metal shall be maintained at or above the preheat temperature until the weld is completed.

1.10 The welding of groove welds in low alloy steels of P-3 to P-5 groups with wall thickness of 19 mm or greater may only be interrupted, provided at least 10 mm of weld metal is deposited, or 25% of the welding groove is filled, whichever is greater. If the welding is interrupted prior to the above, the weld area shall be adequately covered with insulating material to ensure slow cooling. After cooling and before welding is resumed, visual examination of the weld shall be performed to assure that no cracks are formed. Required preheat shall be applied before welding is resumed.

9. POSTWELD HEAT TREATMENT

PWHT shall meet the requirements of ASME BPV Code Section VIII Division 1. Table 3 summarises the PWHT requirements for commonly used materials. For equipment under the purview of IBR, PWHT shall be as per IBR.

9.1 GENERAL REQUIREMENTS

9.1.1 A complete automatic temperature recording shall be made of preheating and stress relieving operations. Where propane gas

burners or electrical resistance coils are employed, a complete temperature record of the preheating and stress relieving operation shall be made by means of a box type potentiometer. Other means of recording temperatures are permissible subject to the PURCHASER's approval.

9.1.2 Stress relief may be local or full furnace. Local stress relief shall be performed with electric induction or electric resistance coils. Suitable gas burning equipment using natural gas or propane may be employed.

9.1.3 At no time during a stress relieving/preheating cycle shall any water or liquid cooling medium be employed.

9.1.4 Where members being joined are unequal in thickness, the dimension of the heavier section shall govern the selection of width of the heated band and the duration of the holding period shall be based on maximum weld thickness.

9.1.5 For local stress relief, using electrical methods, a minimum of two (2) thermocouples tack-welded to the surface and potentiometers shall be used on the part under at least four (4) layers of asbestos paper. The hot junctions of the thermocouples shall be located on either side of the joint at least 12 mm from the edge of the joint but no further away than 100 mm. When employing induction heating, at least six (6) turns of induction cable shall be used on each side of the weld. Induction coils shall be wrapped on top of the asbestos paper protecting the thermocouples with the first turn approximately 150 mm from the centre of the weld.

9.1.6 Local stress relief using gas torches or ring burners may be employed. However, the procedure shall be limited to small items and shall be approved by the PURCHASER.

9.1.7 The stress relieving temperature shall be maintained for a period of time proportioned on the basis of one (1) hour per 25 mm of weld thickness at the joint, but in no case less than one (1) hour.

9.1.8 For piping joints and socket welded joints, pads, bosses, branch welds and couplings, one (1) thermocouple shall be positioned at a minimum distance of two (2) pipe wall thicknesses from the weld.

9.1.9 Equipment on both sides of any joint shall be adequately supported throughout the preheating, welding and stress relieving operations to prevent distortion.

9.1.10 All heating and cooling rates shall be maintained as per ASME BPV Code and time-temperature charts from the recorder shall be made available for review and acceptance.

9.1.11 The VENDOR/CONTRACTOR shall submit a detailed written procedure for the PWHT for the approval of the PURCHASER.

9.2 CARBON STEEL

9.2.1 Welded joints in carbon steel shall be stress relieved, upon completion of the welding operation, in accordance with Table 3.

9.2.2 When local stress relief is employed, the welded joint shall be heated to a temperature of not less than 600°C. The temperature level shall be maintained between 600 and 650°C, one (1) hour per 25 mm of weld thickness but in no case less than one (1) hour. The weld area shall then be allowed to cool undisturbed in still air to a temperature not exceeding 315°C.

9.2.3 Heating and Cooling

Carbon steels, after having reached their specific stress relief temperatures, may be cooled in the furnace or under wraps, i.e., leaving the induction coils or resistance heaters and insulation in

place. This means that, at the stress relief temperatures, the power to the furnace or heating coils may be shut off and cooling takes place in the furnace or with all insulation and coils remaining on the part. For furnace stress relief, the doors of the furnace may be opened after the power is shut off, at or below 315°C. Thermocouples controlling the temperatures shall remain during the cooling cycle so that excessive cooling, if it occurs, can be observed and immediately corrected. The stress relieving coils and insulation shall only be removed after the part has cooled to below 315°C or if stress relieved in a furnace the part may be removed from the furnace and permitted to cool in still air at a temperature not below 10°C.

9.3 ALLOY STEEL

9.3.1 Welds in alloy steel shall be stress relieved after the welding operation in accordance with Table 3. After welding, the material shall be wrapped in asbestos and allowed to cool slowly if PWHT is not carried out immediately.

9.3.2 For full furnace stress relief of a welded assembly, the entire fabricated section shall be heated uniformly to the temperature specified. The temperature shall be maintained for a period of time proportioned on the basis of one (1) hour per 25 mm of weld thickness of the piece having the greatest weld thickness in the furnace charge, but in no case, less than one (1) hour.

9.4 AUSTENITIC STAINLESS STEEL

Welded joints in austenitic stainless steel need not be stress relieved after welding. Solution annealing shall be carried out, if specified.

10. ELECTRODES

10.1 The specification and size of the electrodes, voltages and amperages, thickness of beads and number of passes shall be as specified in the

approved welding procedure or otherwise agreed in writing. Only basic coated electrodes shall be used, which deposit weld will metal having the same or higher physical properties and similar chemical composition to the members being joined. For each batch of approved brand, certificate showing compliance with the specification shall be submitted to the PURCHASER for review before being released for use. All electrodes shall be purchased in sealed containers and stored properly to prevent deterioration. As welding electrodes deteriorate under adverse conditions of storage leading to dampness in the electrode coating, they shall normally be stored in dehumidified air-conditioned rooms or in hot boxes or ovens in their original sealed containers whose temperatures shall be maintained within specified limits. The condition of electrodes shall be frequently inspected. Electrodes with damage to coating shall not be used. Electrodes shall remain identified until consumed. It is preferable to procure low hydrogen electrodes in hermetically sealed containers and preserve them without damage to the containers.

10.2 All low hydrogen electrodes, after baking as per the manufacturer's recommendations, shall be stored in ovens kept at 80 to 100°C before being used. Recommendations of the electrode manufacturer shall be strictly followed. Until the electrodes are taken out for welding, they shall be stored in portable ovens. The electrodes shall not be exposed to open atmosphere.

10.3 For welding of all grades of steel and alloys by the GTAW process, a 2% thoriated tungsten electrode conforming to SFA-5.12-86 EWTh-2 (AWS-A5.1280, EWTh-2) classification shall be used.

10.4 All electrodes to be used on alloy and carbon steel shall conform to ASME BPV Code Section II Part C or any other equivalent code.

10.5 The type of electrodes used shall be only those recommended by the manufacturer for the use in the position in which the welds are to be made.

10.6 Current and polarity shall be maintained as recommended by the electrode manufacturer.

11. INSPECTION AND TESTING

11.1 The PURCHASER shall have free access to inspect welding or any other related operations at any time and at any stage of fabrication.

11.2 The PURCHASER may require NDE of any weld for reasons other than those given in the specification. The responsibility for the cost of such testing shall be mutually decided between the PURCHASER and the VENDOR/CONTRACTOR.

11.3 The VENDOR/CONTRACTOR shall inform the PURCHASER when the weld preparation and set-up for welding of various members selected by the PURCHASER are in progress so that the PURCHASER can inspect the assembly before welding starts.

11.4 The responsibilities of the PURCHASER's representative shall in no way reduce the VENDOR/CONTRACTOR’s responsibilities to ensure that the work is carried out in accordance with the specification.

11.5 Any examination by NDE methods shall be performed before or after PWHT based on the applicable code requirements.

11.6 For a welded branch connection and for any weld, necessary repairs and NDE shall be completed before any reinforcing pad is added.

12. EXAMINATION OF WELDS

12.1 Examination refers to the quality control functions performed by the VENDOR / CONTRACTOR during fabrication, erection and testing.

12.2 As a minimum, the following shall be examined by visual examination:

(a) Materials and components to ensure that these are as per the specification and are free from defects. If defects are noticed on "free issue" items, these shall be brought to the notice of the PURCHASER without delay.

(b) Joint preparation and cleanliness

(c) Fit-up, joint clearance, and internal alignment prior to joining

(d) Preheating as applicable

(e) Variables specified by the welding procedure, including filler material, position and electrode

(f) Condition of the root pass after cleaning - external and where accessible, internal

(g) Slag removal and weld condition between passes

(h) Appearance of the finished joint and weld dimensions

12.3 Acceptance for the visual examination shall be as per ASME BPV Code Section VIII Division 1 or IBR as applicable.

13. QUALIFICATION AND CERTIFICATION OF NDE PERSONNEL

13.1 Approved and documented NDE procedure prepared by level III personnel shall be made available.

13.2 The VENDOR's/CONTRACTOR's examining personnel shall have training and experience commensurate with the needs of the specified examinations. NDE supervisors/ examiners shall be qualified at level II or above of ASME BPV Code Section V.

13.3 The VENDOR/CONTRACTOR shall make available to the PURCHASER copies of certificates of qualification of the examiners he proposes to use for the PURCHASER's approval.

14. METHODS OF EXAMINATION

The methods of examination used, Ultrasonic (UT), Radiographic (RT), MT and PT shall be in accordance with ASME BPV Code, Section V.

Note: All the butt welds has to be qualified using RT.

15. ACCEPTANCE STANDARDS

15.1 Levels of acceptance of defects in welds shall be in accordance with ASME BPV Code Section VIII Division 1.

15.2 For equipment under the purview of IBR, the levels of acceptable defects shall be as per IBR.

16. REPAIR WELDING

16.1 All defects in welds requiring repair shall be removed by flame or arc gouging, grinding, chipping or machining. The major repairs may involve:

(a) Cutting through the weld

(b) Cutting out a portion of material containing the weld, or

(c) Removing the weld metal down to the root depending upon the magnitude of the defects.

16.2 After removing the defect, the repaired portion and adjacent area shall be examined by the same NDE methods as specified for the original weld and the same acceptance criteria shall hold good.

16.3 All the repair welds shall be made using the same or other specified welding procedures as those used in making the original welds including preheating and stress relieving if originally required.

TABLE 1

WELDING SPECIFICATION CHART FOR COMMONLY USED MATERIALS

SL. NO.	BASE MATERIAL	P. NO.	WELDING PROCESS		FILLER MATERIAL		NOTES
			ROOT	FILLER	ROOT	FILLER	
1.0	CARBON STEELS	1	GTAW	GTAW	ER 70S2 OR ER 70S3	ER 70S2 OR ER 70S3	
1.1	≤ 5 mm THICK						
1.2	> 5 mm AND < 19 mm THICK	1	GTAW OR SMAW	GTAW OR SMAW	ER 70S2 OR ER 70S3 OR E 6010	E 6013 F6--EL8 OR E 7018 F7--EL12	
1.3	≥ 19 mm THK	1	GTAW OR SMAW	GTAW OR SMAW	ER 70S2 OR ER 70S3 OR E 6010	E 7018 F7--EL12	1
2.0	LOW ALLOY STEELS	4	GTAW	GTAW	ER 80S B2	ER 80SB2	
2.1	1¼% Cr ½% Mo ≤ 5 mm THICK						
2.2	1¼% Cr ½% Mo > 5 mm THICK	4	GTAW	SMAW	ER 80SB2	E 8016 OR E8018-B2	
2.3	2¼% Cr 1% Mo £ 5 mm THICK	5	GTAW	GTAW	ER 90SB3	ER 90S B3	2 TO 7
2.4	2¼% Cr 1% Mo > 5 mm THICK	5	GTAW	SMAW	ER 90SB3	E 9015 OR E 9016 OR E 9018-B3	2 TO 7
3.0	AUSTENITIC STAINLESS STEELS	8	GTAW	GTAW for ≤ 5 mm THICK	ER 308 (ER 308L)	ER 308 (ER 308L)	2 TO 7
3.1	TYPE 304 (304L)			SMAW for > 5 mm THICK		E 308 (E 308L)	
	TYPE 316			GTAW		ER 316 (ER	

3.2	(316L)	8	GTAW	for ≤ 5 mm THICK	ER 316 (ER316L)	316L)	2 TO 7
				SMAW for > 5 mm THICK		E 316 (E 316L)	
3.3	TYPE 321	8	GTAW	GTAW for ≤ 5 mm THICK	ER 321 OR ER 347	ER 321 OR ER 347	2 TO 7
				SMAW for > 5 mm THICK		E 321 OR E 347	
4.0	STAINLESS STEEL TO CARBON STEEL	8 to 1	GTAW OR SMAW	SMAW	ER 309 OR E 309	E 309	
4.1	SS 304/321						
4.2	SS 316	8 to 1	GTAW OR SMAW	SMAW	ER 309 Mo OR E 309 Mo	E 309 Mo	
4.3	SS 304L	8 to 1	GTAW OR SMAW	SMAW	ER 309L OR E 309L	E 309L	
4.4	SS 316L	8 to 1	GTAW OR SMAW	SMAW	ER 309 MoL OR E 309 MoL	E 309 MoL	

NOTES

1. Low hydrogen electrodes shall be used for critical systems such as chlorine, hydrogen, caustic and similar toxic inflammable fluids and also whenever the wall thickness exceeds 19 mm.
2. The argon shielding gas flow rate shall not be less than 0.34 M^3/Hr.
3. For purging and shielding argon gas shall be used. However, nitrogen may be used as an alternative to argon for purging purpose only. In case of stainless steel, nitrogen may be used where corrosion resistance is not critical.

4. For fillet welds, SMAW may be used instead of GTAW for thicknesses above 5 mm.
5. For GTAW, electrode shall be 2% thoriated tungsten.
6. Initial purging prior to welding process shall be a minimum of five (5) times the volume between dams or ten minutes minimum whichever is higher. When welding commences, the purge gas flow shall ensure that the gas pressure is only marginally higher than atmospheric pressure to ensure no root concavity.
7. Back purging using argon/nitrogen shall be maintained for the root run and a minimum of one (1) additional pass.
8. Electrodes and filler wires manufactured by reputed firms duly approved by the PURCHASER shall only be used.
9. Electrodes shall have at least the same or higher physical properties and similar chemical composition to the members being joined.
10. Read the table in conjunction with para 3.0

TABLE-2

PREHEAT REQUIREMENTS

SL. NO.	BASE MATERIAL	P. NO.	NOMINAL WALL THICKNESS , mm	SPECIFIED MINIMUM TENSILE STRENGTH , mPa	RECOMMENDED MINIMUM PREHEAT TEMPERATURE, °C
1.	CARBON STEEL	1	≤ 25	490	10
2.	CARBON STEEL	1	> 25	490	100
3.	LOW ALLOY STEEL - 1¼% Cr ½% Mo	4	ALL	ALL	149
4.	LOW ALLOY STEEL - 2¼%Cr 1% Mo	5	ALL	ALL	210

TABLE 3

POSTWELD HEAT TREATMENT REQUIREMENTS (FOR COMMONLY USED STEEL MATERIALS)

SL. NO.	BASE MATERIAL	P. NO.	NOMINAL WALL THICKNESS mm	METAL TEMPERATURE RANGE °C
1.	CARBON STEEL	1	≤ 32	NONE
2.	CARBON STEEL	1	> 32	600 TO 650
3.	LOW ALLOY STEEL 1¼% Cr ½% Mo	4 GR 1 AND 2	ALL	600 TO 650
4.	LOW ALLOY STEEL 2¼% Cr 1% Mo	5A GR 1	ALL	680 TO 700
5.	AUSTENITIC STAINLESS STEELS	8, 9	ALL	NOTE 3

NOTES:

1. In IBR systems, in carbon steels, PWHT is also required, when the carbon percentage exceeds 0.25%, at the temperature range of 600 +/- 20°C.

2. For all low alloy steel welds under the purview of IBR, the PWHT shall be carried out at the temperature range of 620 to 660° C for 1 1/4% Cr 1/2% Mo steels and at a range of 660 to 750°C for 2 1/4% Cr 1% Mo steels.

3. Solution annealing shall be carried out after welding of austenitic stainless steel as per the applicable services.

For equipment in carbon steels or alloy steels and meant for lethal service, PWHT of all welds shall be carried out.

SCHEDULE OF PRICES & GENERAL PARTICULARS

1. Bidders shall not alter the contents of this schedule of prices. If the bidder wants any additions / alterations, these shall be brought out separately in the format as given in this schedule of prices.

2. Equipment and material to be supplied and erected shall be in accordance with section A1, A2 & B1 to B4 of this specification.

3. The quoted price shall be price in Indian Rupees for supply of material, manufacture, inspection and testing at manufacturer's works, packing, forwarding, transportation from place of manufacture to site, transit insurance, unloading / receipt at site, storage / handling at site, erection, testing, commissioning and carrying out performance test at site inclusive of all taxes and duties as applicable except sales tax on finished products, and service tax which shall be separately indicated in the price bid.

4. Total price towards Third Party Inspection (to be borne by the supplier) shall be indicated separately in the price bid.

5. SDSC-SHAR reserves right to place order in full or part of the scope

(A) SCHEDULE OF UNIT PRICE

Sl.no	Item	Qty.	Cost in Rs.
1	"FOR SUPPLY OF ITEMS INLCUDING BOUGHTOUT ITEMS" which includes • Procurement, manufacture, supply, testing of Wheel bogie system for SLC which includes "collection of the free issue item, procurement of all fabrication items, machined items, forging of machined items, all bought out items, testing etc., as per the specifications of the tender. • Fabrication of bogie including assembly & testing at vendors site as per technical specifications • Transportation of bogie to SLC site after successful inspection and testing at vendor site as per technical specifications	1 lot	
2	FOR ERECTION, TESTING AND COMMISSIONING OF WHEEL BOGIE SYSTEM AT SITE	1 lot	
3	Third party Inspection charges for Bogie	1 lot	
	Total Cost (1+2+3)		
	IGST @5%		
	G Total Cost:		

SIGNATURE :

NAME :

DESIGNATION:

SEAL OF THE COMPANY DATE

BID QUALIFICATION CRITERIA FOR SUPPLY OF WHEEL BOGIE SYSTEM

Bidders who are qualifying / meeting following Technical and financial criteria are eligible to participate in the bid for supply of Wheel Bogie System. Bidder shall furnish all the information mentioned in the criteria with documentary proof and submit along with quotation. Bids of the parties which are not meeting the following criteria will not be considered for evaluation and will be rejected without seeking any further clarifications.

A. Technical Qualification Requirements:

The bidder shall meet the following technical qualifying requirements and shall submit relevant certificates to establish his credentials.

1. The Bidder shall be an organization with long experience in having executed contracts for manufacture, supply, erection, testing and commissioning of heavy structural works using structural built-up sections.
2. The firm shall have successfully completed Manufacture, Installation, Testing and Commissioning of at least 1 nos. heavy structural work of total 60 t in single work order during last 7 years ending with 31.07.2024. Bidders have to provide relevant certificates from the Owners (end users) along with the submission of bid for consideration of bid document.

   or

   The firm shall have successfully completed Manufacture, Installation, Testing and Commissioning of at least 2 nos. heavy structural work of each 40 t in single work order during last 7 years ending with 31.07.2024. Bidders have to provide relevant certificates from the Owners (end users) along with the submission of bid for consideration of bid document
3. The firm shall have facilities for fabrication and handling big structural items of 10 m long and 8 m wide for fitment, alignment, welding etc., Layout of the shop floor area shall be provided for evaluation.
4. The firm should have successfully completed manufacture, and establishment of Structures to the satisfaction of reputed third-party inspection agencies like M/s MECON, M/s M N Dastur, M/s TCE, M/s Lloyds.
5. **The firm should not have any pending purchase orders from government organization / PSU which is delayed more than 18 months from the original delivery period.**

B. Financial Qualification Requirements:

1. The Bidder should have annual turnover of not less than a value of Rs. 10 crores per year last three financial years ending with 31.07.2024
2. Firm should have undertaken and successfully completed Single work of heavy fabrication works not less than: Rs.3 crore value of works at least in last 05 (Five) years.
3. IT/ TDS certificate shall be submitted with Loss & Profit for last three years
4. Bidder shall submit audited statement of financial status for last three years.

D. The following documents shall be submitted along with the Techno-commercial bid for prequalification of Bidder.

1. Firm establishment certificate and nature of work.
2. Documentary evidence (Technical details &. drawings) for fulfilling special technical conditions as per the RFP document
3. Copy of audited Balance Sheets for last three years
4. IT / TDS certificates for last three years.
5. Current Solvency Certificate for an amount of 2cr.
6. List of value, and work order copies of total projects under Execution with purchase order name and address.
7. Structure and Organization chart.
8. List of personnel with qualification &. experience in the firm in the areas of design, production, quality, safety, administration etc.,
9. List of Machinery & Equipments to be used for the work.

E. Bid Selection Procedure and Process of Pre-Qualification

1. Short listing based on documents submitted, satisfying the all eligibility criteria given above by the firm or individual along with their Bid / application. (Non-submission of any document as given in above list within stipulated time leads to rejection of Bid).
2. Subsequently Bidder's competency, their technical achievements and financial status will be evaluated suitable for this project. Feedbacks from Bidder's clients will be verified.
3. Visit to sites by technical team (ISRO or Third party) where Bidder has established above mentioned works.
4. If required, visit will be made to their factory/ firm by technical team (ISRO or third party) for accessing the capability of manufacturer.
5. Scrutiny of all technical specification and supply conditions mentioned in techno-commercial bid.

SCHEDULE FOR GENERAL PARTICULARS / VENDOR EVALUATION FORMAT

SR. NO.	DESCRIPTION	
1.	Name of Company	
2.	Address of Company	
3.	Type of Company (Proprietary/Pvt.Ltd/Public Ltd/Joint Venure/Consortium)	
4.	Registration number	
5.	Year of inception of the company	
6.	Registered address	
7.	Name & address of the office of the Chief Executive of the company	
8.	Name & Designation of the officer of the Bidder to whom all correspondence shall be made for expeditious technical/ commercial co-ordination. Telephone number Fax number E-mail address	
9.	Locations of the Branches of Company (if any)	
10.	Annual turn-over of the company for the last three years	
11.	IT returns for the last 3 years	
12.	Major customers (Enclose copies of the Purchase Orders)	
13.	Any customers feedback on the services which is in writing (Pl. enclose copies)	
14.	Quality certification of the company	
15.	PAN Card Copy	
16.	The Profit & Loss Account details for the last 3 years which is duly audited and Submitted as part of the Annual Report	

17.	Orders executed during last seven years, at least 1 nos. heavy structural work > 70 T in one single order or 2 heavy structure > 50 T each in sperate orders and one order greater that 5Cr in last five years references are is to be mentioned. (Separate sheet can be attached).	
18.	Shop floor area covered	
19.	No. of employees (Supplier shall mention contract personnel separately) Engineers Supervisors Technicians Quality control engineers Administrative Staff.	
20.	Handling facility available: Over head / Gantry Crane details (Capacity , span lift). Mobile Cranes.	
21.	Load testing facility Available: Maximum weight available. No. of weights Total test load available.	
22.	Welding / fabrication workshop (Type / capacity / quantity of machines shall be provided) MMAW machines GMAW machines Gas cutting machines Plasma cutting machines Welding Fixtures	
23.	Welding professionals: No. of Welders (MMAW), Qualification details, No. of Welders (GMAW), Qualification details, No. of Welders (TIG), Qualification details, Welders Qualified by:	
24.	Details of welding Inspection Equipment & Welding inspector available with supplier (LPT, UT, MPT, X-ray, etc)	
25.	Forming facilities available (with brief specification of each machine) Shearing Machine Cutting Machine Cutting Machine Bending Machine	
26.	Machining Facilities available (with brief specification of each machine) Turning lathe (Conventional /CNC) Milling Machine (Conventional / CNC) Gear Cutting / Hobbing Machines Drilling Machines (conventional / CNC) Cylindrical Grinding Machine (Conventional / CNC)	

	Any other machines.	
27.	Details of inspection facilities / Instruments available (Brief description & specifications shall be provided)	
28.	If third party Inspection Services are taken for fabricating similar works give details.	
29.	Design Software's available Drafting & modeling software packages FEM software Other softwares Design Engineers (with qualification & experience)	
30.	Bid validity period (Min. 4 months from date of bid opening)	
31.	COMPLETION SCHEDULE	

SIGNATURE : _____

NAME : _____

DESIGNATION: _____

SEAL OF THE COMPANY DATE : _____

EXCEPTIONS AND DEVIATIONS

In line with Proposal Document, Bidder may stipulate Exceptions and deviations to the Proposed conditions if considered unavoidable.

Slno	Reference in Specification		Dept. Specification	Offered Specification	Deviation
	Page no	Clause no			

NOTE :

Only deviations are to be written in the above form.

Any deviations taken by the Bidder to the stipulations of the Proposal document shall be brought out strictly as per this format and enclosed along with the bid.

Any deviations not brought out in this Proforma and written elsewhere in the Proposal document shall not be recognized and the same is treated as null and void.

Any wilful attempt by the Bidders to camouflage the deviations by giving them in the covering letter or in any other documents that are enclosed may render the Bid itself non-responsive.

SIGNATURE : _____

NAME : _____

DESIGNATION: _____

SEAL OF THE COMPANY DATE : _____

SCHEDULE OF BIDDERS EXPERIENCE

The bidder shall furnish here under a list of STRUCTURAL works executed by him to whom a reference may be made by the PURCHASER in case the PURCHASER considers such a reference necessary.

SL. NO.	Name & address of Client / Name & address of project or plant (incl. tel.no., fax no., e-mail and name & designation of person who can be contacted.	Purchase Order / Contact no. and Date.	Brief details of equipment / system covered	Scope of services	Contract price (Rs)	Scheduled date of completion	Actual date of completion	Reasons for delay in completion, if applicable.	REMARKS

SIGNATURE: :
NAME :
DESIGNATION:
COMPANY :
DATE :

COMPANY SEAL

SCHEDULE OF BIDDERS PRESENT WORK

The bidder shall furnish here under a list of Structural works being executed to whom a reference may be made by the PURCHASER in case the PURCHASER considers such a reference necessary.

SL. NO.	Name & address of Client / Name & address of project or plant (incl. tel.no., fax no., e-mail and name & designation of person who can be contacted.	Purchase Order / Contact no. and Date.	Brief details of equipment / system covered	Scope of services	Contract price (Rs)	Scheduled date of completion	Expected date of completion	REMARKS

SIGNATURE: :
NAME :
DESIGNATION:
COMPANY :
DATE :

Company Seal

DATA TO BE FILLED ALONG WITH THE BID FOR SUPPLY & COMMISSIONING OF BOGIE

SR. NO.	DESCRIPTION	TENDERS OFFER
1.0	Confirm that the system shall be realised as per technical specification, approved manufacturing drawings, bill of material to meet the functional requirement.	Yes / No
2.0	Confirm that all the electrical items shall be procured as per specification and to be erected tested & commissioned at site.	Yes / No
3.0	Confirm that all the bought out items are to be procured as per the specification from the approved parties	Yes / No
4.0	Confirm that all the bought out items are to be inspected at the inspected by TPIA / Departmental representative at Vendors shop before reaching to manufacturer's shop	Yes / No
5.0	Confirm that fabrication of all items shall be done as per IS:800 & tolerance in fabrication shall be maintained as specified in relevant drawings.	Yes / No
6.0	Confirm that all sub-assemblies shall be tested for proper functioning, free running, bearing noise etc. & shall be brought to site in grease packed condition.	Yes / No
7.0	Confirm that all the items shall be painted as per painting scheme.	Yes / No
8.0	Erection sequence shall be submitted along with offer.	Yes / No
9.0	Manufacturing schedule & Erection schedule shall be submitted along with offer.	Yes / No
10.0	Resources planning shall be submitted along with offer	Yes / No
11.0	Man power planning for erection shall be submitted	Yes / No
12.0	Confirm that testing and commissioning of the total system shall be carried out as per specification.	Yes / No
13.0	Confirm that QAP for fabricated items, machined items, Sub-assemblies and for bogie in assembled condition shall be submitted for approval.	Yes / No

CHECK LIST

Sl no	Description	Response by supplier
1.	All documents related to Prequalification criteria mention in Section C2 have been met and all related documents are enclosed in technical Bid	Yes / No
2.	Are all the technical particulars as called for in the data sheets section A & B and commercial details as called for in schedule of prices filled up	Yes / No
3.	The detailed scope of work and technical specifications are understood and price was quoted accordingly.	Yes / No
4.	Confirmation that the quoted prices are firm and fixed till the completion of scope of work.	Yes / No
5.	Validity of Offer is 4 months (minimum).	Yes / No
6.	Vendor Evaluation Format is attached	Yes / No
7.	List of Customs Duty Exemption Certificate (CDEC) items are submitted for providing CDEC by Department.	Yes / No
8.	List of Excise Duty Exemption Certificate (EDEC) items are submitted for providing EDEC by Department.	Yes / No
9.	Delivery Schedule with milestones	Yes / No
10.	Accepted the Department Payment Terms	Option:1 or option-2
11.	Are General terms and Conditions of Contract for Supply & Erection included in proposal acceptable?	Yes / No
12.	If not acceptable, are the deviations brought out in the "Schedule of Deviations"	Yes / No
13.	Are there any deviations from enquiry technical specifications?	Yes / No
14.	If there are technical deviations, are these filled in "Schedule of Deviations from Tech. Specifications"?	Yes / No
15.	Warranty for the fully commissioned and accepted system is 12 months	Yes / No
16.	3 % of the Order Value shall be submitted as Performance Bank Guarantee, which is valid till completion of the warranty period plus 3 months claim period.	Yes / No
17.	Liquidated Damages are acceptable	Yes / No
18.	Last three years audited financial results are enclosed	Yes / No
19.	Registration certificate of the company is enclosed	Yes / No
20.	All the forms in Section C1 to C6 are filled	Yes / No
21.	Are all data sheets A/B duly filled in and submitted in offer	Yes / No
22.	Technical documents / drawings are attached along with technical bid	Yes / No

Signature of the tenderer.